

SIERRA LEONE

Annual Report

OF THE

Department of Agriculture

For the Year 1938



1939

Printed by the GOVERNMENT PRINTER, Freetown.





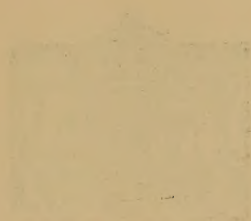
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UNITED STATES

Annual Report

Department of Agriculture

G.P.D. O 1496—450. 18-8-39.

For the Year 1938

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DEPARTMENT OF AGRICULTURE.

STAFF AT 31ST DECEMBER, 1938.

DIRECTOR.

F. J. Martin, M.A., PH.D., F.I.C., DIP. AGRIC. (Cantab.).

AGRICULTURAL OFFICERS.

Southern Province:

J. W. D. Fisher, DIP. AGRIC. (Edinburgh).

G. M. Roddan, B.Sc. (Glasgow), N.D.A., A.I.C.T.A.

J. D. Gillespie, B.Sc. (AGRIC.), (Edinburgh).

M. J. Douglass, B.Sc. (AGRIC.) (London), N.D.A., DIP.
AGRIC. (Wye).

Northern Province:

R. R. Glanville, M.B.E., B.A., AGRIC. B. (Dublin), A.R.C.S.
(Ireland).

E. I. Nisbett, DIP. HORT. (Reading).

E. S. Garner, M.A. (Oxon), M.Sc. (California).

A. F. MacKenzie, A.R.C.S., B.Sc. (London), A.I.C.T.A.

Colony Peninsula:

H. Macluskie, DIP. AGRIC. (Aberdeen).

LIVESTOCK OFFICER.

S. A. Roach.

Inspector of Plants and Produce:

F. W. Browning-Allinson.

JUNIOR STAFF (PENSIONABLE) .

Agricultural Instructors:

Grade 1 (a)—S. I. Bull, C. A. Tucker, R. S. Carey,
A. R. T. Bangura.

Grade 1 (b)—T. S. H. Williams, A. B. Sidigi, M. L. Smith,
D. J. Hadji, C. W. Davies, F. J. Short,
S. B. Kamara.

RESEARCH OFFICERS. .

Plant Pathologist:

F. C. Deighton, M.A. (Cantab.).

Junior Mycological Assistant:

B. Kallon.

Entomologist:

Vacant.

Entomological Assistant:

J. S. Wellington.

ANNUAL REPORT OF THE AGRICULTURAL DEPARTMENT.

TO THE HONOURABLE
THE COLONIAL SECRETARY.

3rd August, 1939.

SIR,

I have the honour to submit my report for the year 1938.

INTRODUCTION.

AGRICULTURAL POLICY OF GOVERNMENT.

2. While the report is submitted in the usual form—that recommended by the Secretary of State—it is preceded by a short introductory note setting forth the Policy of the Government with respect to Agriculture and the programme of the Department to put into effect the policy of the Government.

3. It is now five years since this policy was framed by the Agricultural Department and about four since it was finally approved and accepted as the Agricultural Policy of Government. Since that time the effect of a settled policy, clearly defined and officially approved, has been most marked. The result has been fuller co-operation with other departments, a steady growth in the activities of the department, and, following behind the necessary investigational work, the agricultural development of the various types of country can be, has been, and will continue to be, pursued logically and expanded steadily by the whole department as and when funds become available. In certain areas our investigational work has reached a point when development can be confidently recommended along specific lines; in others further research is necessary; while some areas, owing to lack of necessary provision of staff and money, we have not been able to touch at all.

4. The main lines of policy are given below in heavy print the broad methods of implementing the policy are given in less heavy print, while the specific steps already taken in regard to investigation and extension work are given in ordinary type. Proposals which have been accepted in principle by Government but for which money is not available are shown in italics while proposals which are still under consideration are given in italics and underlined. The policy of Government, the work accomplished or in progress, and the proposals for future development based on past investigations and local experience, give a clear picture of the work upon which the department is engaged.

5. The Annual Reports of this Department will now show not only the work accomplished during the particular year under review, but how such work fits into the general framework of the

Government's policy for agricultural development. The details of the policy are as follows:—

A. The adequate provision of food for the people.

This is to be accomplished by:—

I. The Improvement and Spread of Swamp Rice Cultivation to such an extent that not only will the needs of the people be supplied in a bad year but there will be a Surplus for Export in ordinary years.

Steps already taken to achieve this are:—

- (a) The establishment of a rice station at Rokupr for the breeding and introduction of rice to suit all the conditions found for wet rice. (Certain types have already been found, multiplied and distributed).
- (b) A scheme, originally financed by the Colonial Development Fund, has been worked out for the distribution of good seed—over 2,000 bushels were distributed last season. The scheme is a great success and the amount of seed increases annually.
- (c) Farmers' Societies have been formed for the better cultivation, harvesting and marketing of rice. (Three Societies are already working successfully).
- (d) A Rice Mill has been erected for the cleaning of rice not only for the local market but up to a grade suitable for export.
- (e) Certain markets have been investigated where Sierra Leone rice might possibly be sold. Investigations made include the United Kingdom and the Gold Coast for G.E.B. 24 rice, and the Gambia for three types of rice.
- (f) Agricultural surveys of certain swamp areas are made as opportunity occurs; those already surveyed include the Scarcies area, the Kafu Bullom Chiefdom (part), the Colony (East) area, the rivers running into Yawri Bay (Moyamba District), and the Bagru Creek.
- (g) A station was opened at Sembahun in November, 1938, for the following purposes:—
 - (i) To develop the mangrove swamps bordering the Bagru Creek by:—
 - (a) assisting by loan the felling of mangrove for proposed farms,
 - (b) providing suitable seed for the Bagru area,

- (c) assisting by advice in seed selection, harvesting and marketing.
- (ii) To assist in developing swamps generally in Moyamba District.
- (h) The investigation of rice-growing in empoldered areas near the coast has started. An area of a few acres has been empoldered and one rice crop already taken.

Steps already proposed (and approved in principle by Government) with a view to further development; funds are not yet available but application has been made to the Colonial Development Fund.

A thorough survey by an Irrigation and Drainage Engineer to obtain information, and put up schemes, with regard to :—

- (i) *the possibilities of bringing into cultivation in the Scarcies, and elsewhere large areas (not necessarily near the coast) at present too salty or too deeply flooded to be suitable for rice,*
- (ii) *the extent and possibilities of empoldering land near the coast for the cultivation of rice, and*
- (iii) *the possibilities of water control in inland swamps, in order to establish a permanent form of cultivation.*

Steps under consideration but not yet approved by Government.

- (i) *The establishment of a revolving fund for the clearing of the tidal swamps in the Moyamba District for rice production. It is suggested that the Protectorate Mining Benefits Fund might be approached for this purpose.*
- (ii) *The establishment of a seed multiplication farm at Rokupr.*

II. The Better Cultivation of Inland Swamps and Valleys for Rice during the Wet-Season and Crops other than Rice during the Dry Season.

Steps already taken to achieve this are :—

- A. Extensive propaganda to encourage the use of inland swamps which, without any drainage or irrigation works, can be used for cultivating rice during the wet season.
- B. The distribution of rice suitable for the various types of swamps, and propaganda to encourage the use of the transplanting method in place of broadcasting.

C. Instruction in the use of swamps for sweet potatoes and/or other vegetables during the dry season where the natural conditions are suitable.

D. Investigations in the control of water in small swamps (one small station at Makeni).

Steps already proposed (and approved in principle by Government) for the development of inland swamps but for which funds are not yet available are:—

(i) *An investigation by an Irrigation and Drainage Engineer with regard to the possibilities of some form of control of water in large inland swamps and in valley bottoms with a view to the establishment of a permanent form of cultivation. (An application has been made for assistance to the Colonial Development Fund).*

(ii) *The establishment of a station for investigations in regard to the development of, and demonstration of proved methods in respect to, a more permanent form of cultivation in the swamps and valley bottoms in the interior. (An application for assistance has been made to the Protectorate Mining Benefits Fund).*

III. The Extension of Garden and Small-field Crops to serve as an Auxiliary Food Supply.

Steps already taken:—

Introduction and multiplication of good types of crops. Successful types have already been distributed particularly in those areas round Agricultural Stations and Sub-stations (*see also IV*).

IV. The Selection (or Introduction) and Distribution of Seeds and Plants Suitable for (I) (II) and III.

Steps already taken:—

(a) With regard to rice a Research Station has been opened at Rokupr and has proved the suitability of certain types of rices. These are either being multiplied for distribution or have already been multiplied and distributed. Further types are still being tried.

(b) With regard to other crops—

(i) *Cassava*—two types of cassava resistant to a considerable degree to Mosaic (Mayugbe and Two-Cent) have been widely distributed.

(ii) *Yams*—New types of yams have been introduced. Some are still on trial but the most successful introductions (Chinese and Jaffna King Yams) have been widely distributed.

(iii) *Beans*—many different types are being tried but some have now reached the stage when distribution in certain areas can be recommended,

- (iv) *Sweet Potatoes*—Several varieties introduced recently have proved to be valuable acquisitions and are being distributed.
 - (v) *Tomatoes*—Investigations are being made to find types resistant to wilt and blossom-end rot.
 - (vi) *Spinach*—Various types of plants whose foliage can be used as “spinach” are being grown under observation. Some can now definitely be recommended for general use, others are still under observation.
 - (vii) Pineapples of various kinds have been introduced and grown under observation.
- U. *Fruit Trees*.—Trees of certain varieties of citrus and mango have been introduced and those found successful are being vegetatively reproduced in quantity for distribution.

V Improvement of Poultry and Stock.

Steps already taken to achieve this are:—

A. Poultry:

- (i) Trials with various types of fowls have been carried out and the Rhode Island Red breed selected as the most suitable.
- (ii) The multiplication and distribution of this breed is proceeding and “free range” methods on grass fields have been recently adopted with good results when breeding stock.
- (iii) Distribution takes two forms:—
 - (a) direct sale to those who realise the possibilities of improving poultry and
 - (b) village improvement by replacing with Rhode Island Red cocks all male poultry in selected villages.
- (iv) Experiments are proceeding with ducks and guinea fowls.

B. Stock:

- (i) *Cattle*.—A small herd of selected local cattle has been established at Njala, the object being:—
 - (a) to improve the type by local selection
 - (b) to study the best methods of animal husbandry under Sierra Leone conditions.
- (ii) *Sheep*.—A small flock of selected ewes and rams has been established at Njala for the improvement of the local breed.

- (iii) *Pigs*.—A study has been made of the pigs to be found in the country and a type of pig, small in size but neat in type, has been selected for improvement. It is thought that these should cross well with Berkshire sires which have already been ordered.

Steps proposed for which provision has been made by Government but work not yet started.

A Livestock Farm in the northern part of the Protectorate for the following purposes:

- (a) *To improve the local type of cattle by selective breeding and crossing with imported stock if necessary.*
- (b) *To raise good bulls for breeding and cows for distribution. (This country suffers from a dearth of cattle and has a low proportion of cows to bulls).*
- (c) *To study methods of animal husbandry.*

A Livestock Officer has been appointed to the staff of the department and a site for the Stock Farm near Makeni has been provisionally selected.

B. The Cultivation of Money Crops or Exploitation of Wild Trees for Export Purposes.

These crops include oil-palms, cocoa, coffee, rice, ginger, kola, chillies, fruits and piassava.

Steps already taken to achieve these are:—

1. The introduction and breeding of good quality oil-palms at Njala.
2. The establishment of an oil-palm plantation and mill at Masanki.
3. The encouragement of cocoa in the High Bush area.

The Provincial Administration distributed cocoa seed throughout the old Southern Province ten to fifteen years ago and some eight to ten years ago propaganda was carried out by this Department and many cocoa plantations were established. Of these plantations only those established in the "High Bush" area were a success. These are now in bearing and prove that within certain limits (High Bush area) cocoa can be successfully cultivated.

Steps proposed.—The following schemes have been recommended and approved in principle by Government:—

- (a) *the appointment of an Agricultural Officer in the High Bush country (1939 Estimates),*
- (b) *the building of a road from Giema to Zimi through the middle of the main area suitable for cocoa (this road is now placed first on the list of Protectorate Roads to be constructed—the money for this road has not yet been voted).*

4. The encouragement of coffee wherever shade and other conditions are suitable.
5. The investigation and methods of cultivation of ginger. Canton, Jamaica and Dominican Ginger have been imported and are being grown experimentally. Local ginger has been separated into three types—black, red and white.

It is proposed to grow all these types under differing conditions with a view to seeing which of the existing local gingers (normally all mixed together) or any imported varieties can be processed in such a manner as to widen the market for Sierra Leone gingers.

6. The investigation of kola pests by the Entomologist.
7. The importation of different forms of chillies and the carrying out of trials in this country.
8. The importation of improved types of fruits and budding and grafting on to good local root stocks, e.g. grapefruit, oranges, mangoes.
9. Propaganda with regard to the retting and preparation of piassava.

C. The Arresting of the Degradation of the Forest Growth of Sierra Leone or at any rate Increasing the Regeneration Period between Successive Brushings of the Same Area by.

1. Encouraging swamp and valley cultivation as an alternative to upland farming—the main centres from which propaganda is carried out are:—Njala, Sembahun, Newton and Rokupr. (*For other proposals see A II*).
2. Investigating means of establishing more permanent forms of upland farming than the present shifting cultivation.

Investigations to achieve this are being carried out at the Research Farm at Njala. They take the form of trying various rotations with different green cover crops and they will extend over a long period of years.

D. The Improvement in the Preparation and Marketing of Produce.

This includes:—

1. *The use of Rice Milling Machinery.*—A rice mill is already in use. It is an up-to-date 3-cone mill with the necessary provision for parboiling and drying during the dry season. The necessary apparatus has been ordered for constructing a drying plant for working in the wet season. The mill is capable of dealing with either parboiled or dry rice.

2. *Introduction of Co-operative methods with a view to narrowing the gap between the prices paid to producers and by consumers to the mutual advantage of both.* Farmers' Societies have been started in the Scarcies area at Mamholo, Kichom and Rokupr and are working well.

Legislation has been passed to regularize the position of Co-operative Societies.

Government has under consideration the necessary organisation to develop co-operation among the agricultural community. The Agricultural Department advises that for the time being the Director of Agriculture should be appointed Registrar of Co-operative Societies, that an officer of Government should be selected to undergo training in co-operative work and that on his return to the Colony he shall be attached to the Agricultural Department until such time as the co-operative movement spreads beyond agricultural industries. A separate department for Co-operative Societies can then be formed.

E. Preservation of the Standard of Export Produce by Inspection.

Produce for which standards are already fixed—palm-oil, palm kernels, piassava, ginger, raffia, rice and fruits.

A Produce Advisory Committee with one representative from the administration, four from the mercantile firms, the Inspector of Plants and Produce and with the Director of Agriculture as Chairman has been appointed to advise Government with regard to the steps which should be taken to improve the standard of Sierra Leone produce and to facilitate inspection. The Committee has proved of considerable service to Government.

F. Co-operation with Education Department where possible in the Teaching of Agriculture.

A joint scheme for training agricultural apprentices and teachers for rural schools has been worked out by the two departments concerned. Provision has been made from the Protectorate Mining Benefits Fund and buildings for housing these students were commenced in 1938. (Before going to press the scheme had so far progressed that the pupils assembled on the 11th and 12th April, 1939 and the course commenced on the 13th April).

The Director of Education and the Director of Agriculture serve together on the Board of Management of the S. B. Thomas' Agricultural Academy, Mabang, and are able, by their joint influence, to be of considerable help to that Institution.

G. Research.

For the most part research is confined to immediate problems, but as and when time permits, investigations into what may be termed long range problems are carried out. In all cases Research Officers co-operate with Agricultural Officers in general agricultural work and investigate problems as they arise, e.g. rice and kola storage, coffee borers, locust, citrus scab, soil fungi, fruit rots, etc.

(1) ENTOMOLOGY.—A survey of plant pests of wild as well as cultivated plants has been carried out with special reference to the presence or absence in Sierra Leone of serious pests. The results of this survey were embodied in a publication "Some Insects and their Food Plants in Sierra Leone" in 1937. Special investigations have been carried out concerning "Fruit Piercing Lepidoptera" and the results were published in 1936.

(2) PLANT PATHOLOGY.—

- (a) A survey has been made of the various diseases of wild and cultivated plants in Sierra Leone and a "Preliminary List of Fungi Diseases of Plants in Sierra Leone" was published in 1936.

This work will be continued and it is anticipated that a second list of fungi, etc. will be due for publication by 1941. A description of some of the species of Sierra Leone fungi (including many new to Science) will be ready for publication in two or three years.

- (b) Eradication of Plant Pests and Diseases where possible.—Citrus scab has been nearly eradicated from Sierra Leone.

(3) BOTANICAL.—(Carried out by the Plant Pathologist).—

- (a) *Selection and Breeding of Oil-palms.*—Records have been kept for some years and while it is accepted that the main oil-palm research work for West Africa will in future be carried on in Nigeria, certain phases of the Sierra Leone work, in particular with the Angola Palm, which appears to be exceptionally promising, must be continued.

- (b) *Herbarium*.—A large herbarium has been built up at Njala including most of the Sierra Leone grasses, herbs and shrubs and it may now be said that almost any cultivated or wild plant in Sierra Leone can be identified at once. (This does not refer to forest trees as that branch of investigation is in the hands of the Forestry Department).
- (c) *Vernacular Names and Uses of Wild and Cultivated Plants*.—A large index in the various Sierra Leone languages of the vernacular names of wild and cultivated plants, and of their uses, is being prepared and is nearing completion.

It is proposed to publish a vocabulary with description of wild and cultivated plant names together with the known uses of the plants, within the next year or two.

- (d) *Cassava Varieties*.—A key to cassava varieties grown in Sierra Leone was compiled for departmental use in 1933.

(4) **CHEMISTRY**.—A survey has been made of the types and distribution of Sierra Leone soils and the results have been published. Special investigations have been made and published with regard to the properties of lateritic soils.

At present no Chemist is on the staff of the Agricultural Department but when funds are available it is proposed to recommend that a Chemist be appointed to investigate the properties of swamp soils and the nutritive values of various vegetables and field crops grown in Sierra Leone.

H. Conservation of Soil.

The whole work of the Agricultural Department is directed to establishing methods of cultivation which will prevent erosion and conserve the fertility of the soil. Methods suitable for certain types of swamps have been worked out and investigations proposed in regard to other types. (See A. II).

A committee has been established to advise Government with regard to measures which should be taken to combat soil erosion.

I. Nutrition.

A committee has been formed to advise Government on all aspects concerning nutrition. There are two main aspects in Sierra Leone—"sub-nutrition" which the Agricultural Department has rectified to some

extent by the production of rice in swamps to the point when the former annual "hungry" season is no longer really serious, and "mal-nutrition" due to an improperly balanced diet. The Sierra Leone diet is too largely composed of carbohydrates and it is the object of the Agricultural Department to produce more animal proteins (*see* A.V.) and more vegetables and fruit (*see* A. IV. B and C).

J. Extension Work—All Extension Work and Propaganda must be based on information gained from Experiment, or from Experience by Agricultural Officers, within Sierra Leone.

It is essential to stick rigidly to this principle since attempts to "guess" what "might" do well in this country have frequently proved wrong in the past and recommendations not proved by local experience may result in loss of money and labour to the natives and loss of confidence in the Department.

Agricultural Officers and Agricultural Instructors carry out extension work from the following main Agricultural Stations. Small sub-stations run by African Instructors are supervised from the main stations.

Existing Agricultural Stations.	Area Served.	Chief aspects of Extension Work.
Rokupr	... Port Loko District	Swamp rice in tidal areas.
Newton	... Colony Peninsula ...	Vegetable and fruit production in hilly area. Swamp rice in inland and tidal swamps.
Njala ...	... Moyamba District (S) Bo District	Upland crops, e.g. oil-palms cocoa, coffee, yams, ginger, beans, vegetables, fruit, etc.; also rice and sweet potatoes in inland swamps.
Sembehun	... Moyamba District (S) Bonthe District (part)	Swamp rice in tidal and inland swamps.

PROPOSED STATIONS,

Makeni (i)	... Chiefly northern part of Sierra Leone.	Breeding of cattle and small stock. (Site selected and provision made in 1939 Estimates but work not yet started).
Makeni (ii)	... Bombali District (part), Karene District (part), Tokolili District (part).	Inland swamp cultivation—rice and crops that can be grown in rotation with rice in inland swamps. The use of oxen for ploughing and providing manure. (Application made for funds to Protectorate Mining Benefits Fund).
Kenema	... High bush country.	Cocoa, coffee and inland swamp cultivation; also preparation of piassava. (Provision made in 1939 Estimates but work not yet started).

6. From the above description of the policy and work of this department it will be seen that the Agricultural Department has now reached a new point in its history—a point where it can now recommend development along certain lines, confident, from its investigations and experience, that success will follow its recommendations. It is true that the lines of development which we can recommend are mainly limited to the development of swamp areas for rice and other food crops, and the development and preservation of the high bush for cocoa, oil-palms, coffee, kola and tree crops generally, but these areas are extensive, and their proper development will have far-reaching effects upon farming in Sierra Leone. It is possible that the progress made by this Department in the last five years may have appeared slow; for this, lack of staff, which we are gradually augmenting, is chiefly responsible, but it is our policy to precede development by patient investigation, to withhold recommendations until certainty succeeds doubt, and to restrain ourselves from rushing into schemes of development until we are as sure as experiment and experience can make us that success will follow our recommendations. Improvements in agriculture, if sound, are rarely spectacular and the steady and permanent progress made by this department in the past few years is better than the sounding of many horns or the blowing of many trumpets.

7. It must here be confessed that we have nothing but disappointment to report regarding trials with systems of agriculture involving the permanent cultivation of annual food crops on upland farms. The heavy rainfall, the violent tornadoes and rain storms at the beginning of the rainy season before the crop can form a protective cover for the soil against erosion, the heavy and constant leaching, the lateritic character of the soil, the undulating and sometimes steeply sloping nature of the land, the general absence of cattle, and, in the southern area, the presence of the tse-tse fly, all militate against any permanent method of cultivation of annual crops on the upland areas. It is some comfort that we do not stand alone in our inability to solve this problem and in speaking of Malaya ⁽¹⁾ Sir Frank Stockdale sums up the position in words, every one of which applies to our conditions. He says:—

“ Trials with annual food crops have on the whole been disappointing. These results bear out experience in the wet tropics elsewhere, and the conclusion reached is that in the wet tropics the cultivation of orchard or tree crops offers greater possibilities of success than the cultivation of those annual crops such as maize, ground-nuts, etc., which necessitate that the soil shall be uncovered during periods of the year, and thereby made liable to loss of fertility through leaching by reason of continued falls of rain. Under these conditions, it is only by the use of large quantities of farm-yard manure, composts or

(1) C.A.C. Report on a visit to Malaya, Java, Sumatra and Ceylon, p. 55.

(2) W.A. Review, Vol. X 141, 1939.

mulches that fertility can be maintained, and it is even doubtful if a system of agriculture which is economic can be satisfactorily evolved."

8. The position is quite different with regard to wet-land rice cultivation (where different biological conditions prevail) and the development of trees crops. Paragraphs 66 to 72 and 80 show actual development in the Scarries Area; paragraphs 39 to 42 show how development can now go ahead in the southern part of the Moyamba District; and paragraphs 30, 31, 90 and 91 show the cocoa industry in the high bush area in the Kenema-Zimipendembu region and how it could be developed. All that is now required in these areas is the money to push ahead with development. Sir Bernard Bourdillion ⁽²⁾ has said of Nigeria:—

"No appreciable acceleration in the rate of economic progress can be expected without the provision of capital which is not at present available."

The provision of capital for development is equally necessary in Sierra Leone.

SECTION I—GENERAL REVIEW OF CROPS INCLUDING EXPORTS.

9. The past year proved an excellent one for upland farmers, and the early rains interfered but little in the burning and preparations of farms. Taking the country as a whole, the upland farms were larger and more productive than normal. The area of wetland farms was also greater than the average and during 1938 probably a greater quantity of rice was grown than ever before. Not only was a greater area of rice grown, but large quantities of other foodstuffs were grown and this was reflected in the amounts of produce carried on the railway (*see* paragraphs 36 and 37).

10. *Rice*.—Rice is the staple food of the country and it is pleasing to be able to record that the harvest of 1938 will ensure a plentiful supply for 1939. The supply of rice in 1938, derived from the harvest in 1937, was, as I indicated in my last report, quite sufficient for the needs of the country; in fact, there was a surplus. This only became apparent about July/August when the usual rush to off-load any surplus stocks before the harvesting of the early rice resulted in the usual depressing of the price from then onwards, reaching a low limit of 4s. 3d. a bushel in November. A surplus in 1938, coupled with the large area under rice during that year, not only ensures enough rice for 1939, but also a surplus; and unless this surplus can be exported the price of rice will be adversely affected.

11. In January, a meeting of traders interested in rice was held to consider the situation for 1938. It was clear that the greater part of the meeting was of the opinion that there was sufficient rice in the country and that Government need take no special steps towards assuring supplies. In view of this, it was curious that the price of rice should have been maintained at a comparatively high figure until July, but this was probably due to the fear that the shortage of the previous year might in some part be repeated, and to an inclination to treat a meeting called by Government to discuss the rice situation as some evidence of shortage, despite the expressed opinion of the Agricultural Department to the contrary.

12. A consideration of figures obtained showing the movements of rice by rail and by water, reveals the fact that Freetown received nearly three times as much rice from the interior by rail in 1938 as in 1937, while the amount received from the rivers was doubled. This rice, of course, replaced the rice which was imported during the shortage in 1937, but it will be seen by comparing figures that the consumption in Freetown went up from 4,734 tons in 1937 to 5,628 tons in 1938. This is most interesting for it shows that in one of the worst trading years on record, the native population of Freetown has been better supplied with its staple food than in the previous and more prosperous year. The following table shows the movement of rice in and out of Freetown from all sources:—

Into Freetown.					Out of Freetown.			
1938. (2)	Imports from abroad	From Interior by Water	From Interior by Rail.	Total.	(1) By Water.	By Rail.	Total.	Left for consumption.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
January ...	2	218	186	406	10	8	18	388
February ...	—	571	222	793	—	1	1	792
March ...	100	122	84	306	20	1	21	285
April ...	144	109	118	371	1	—	1	370
May ...	11	235	124	370	3	1	4	366
June ...	—	385	237	622	15	1	16	606
July ...	—	223	251	474	38	9	47	427
August ...	—	101	162	263	23	1	24	239
September ...	—	132	205	337	50	8	58	279
October ...	24	111	434	569	18	1	19	550
November ...	17	231	810	858	100	1	101	757
December ...	1	397	301	699	129	1	130	569
1938 ...	299	2,835	3,134	6,068	407	33	440	5,628

FOR COMPARISON :—

1937 ... 3,738 1,492 1,151 6,381 152 1,495 1,648 4,734.

(2) Note.—Wherever the word “tons” is used in this Report “Long tons” is meant.

(1) Includes Exports as shown in paragraph 15.

13. It will be seen that very little rice was imported, and this was all dry cleaned white rice which has a firm but limited market for the preparation of a certain kind of food. The price of rice is given in the following table and it will be seen to have reached a maximum of 7*s.* as compared with 11*s.* in the previous year, the average being 5*s.* 6*d.* a bushel as against an average of 9*s.* 6*d.* in 1937.

PRICE OF RICE.

January ...	...	...	6 <i>s.</i> to 7 <i>s.</i>
February ...	...	...	6 <i>s.</i>
March ...	...	...	6 <i>s.</i>
April ...	...	...	6 <i>s.</i>
May ...	...	...	6 <i>s.</i>
June ...	...	...	6 <i>s.</i>
July ...	...	...	6 <i>s.</i> to 5 <i>s.</i> 6 <i>d.</i>
August ...	...	...	5 <i>s.</i> 6 <i>d.</i>
September ...	...	...	5 <i>s.</i> 6 <i>d.</i> to 5 <i>s.</i>
October ...	...	...	4 <i>s.</i> 6 <i>d.</i> to 4 <i>s.</i>
November ...	...	...	4 <i>s.</i> 3 <i>d.</i> to 4 <i>s.</i> 6 <i>d.</i>
December ...	...	...	4 <i>s.</i> 6 <i>d.</i> to 5 <i>s.</i>

14. In view of the surplus of rice, and the cheap rate at which it could be obtained, efforts were made to export rice to the Gambia and during the last two months of 1938 some 332 tons were exported. It appeared, however, that the demand for Sierra Leone rice in the Gambia was limited and great difficulty was experienced in disposing of the rice. This was strange in view of the fact that the rice in Freetown was of good quality and cheap, and that the Gambia is a market requiring cheap rice rather than high grade rice. Sierra Leone rice at that time was certainly the cheapest form of rice it could import. It was **therefore** arranged that the Director of Agriculture should visit Bathurst, Gambia, and enquire into market conditions. The visit could not take place before the end of 1938 but was subsequently accomplished in early 1939 with very profitable results.

15. The following figures for imports and exports of rice show that Sierra Leone, after its one bad year, 1936 to 1937, has again reached the position when she can supply her own needs:—

—		Imports of White Rice, Tons.	Exports, Native Rice, Tons.	Excess (+) or Deficit (–) of Exports over Imports, Tons.
Average	1920–29 ...	986	96	– 890
	1930 ...	2,618	175	– 2,443
	1931 ...	457	177	– 280
	1932 ...	301	559	+ 258
	1933 ...	125	158	+ 33
	1934 ...	81	221	+ 140
	1935 ...	29	1,024	+ 995
	1936 ...	45	204	+ 159
	1937 ...	4,204	8	– 4,196
	1938 ...	341	332	– 9

16. In my report last year I estimated the demands of the Freetown market as 5,000 to 6,000 tons in a normal year and this estimate is confirmed by the figures given in paragraph 12 which show the consumption in 1938 to be 5,628 tons. The requirements for the mining market are less easily ascertainable. We know the number of men actually employed by the mines and we know that these consume approximately 1 lb. of rice a day each, or a total quantity of approximately 2,500 tons a year; but the number of labourers actually engaged in the mining industry must be increased by the number of wives, children and other dependents before the consumption of the mining industry can be reached. Having due regard to these dependents, it would appear that it would not be safe to estimate the demand of this market at anything less than 5,000 tons a year. An investigation of the railway figures shows that of the 5,217 tons carried on the railway only 3,134 made their way to Freetown and it is safe to assume that the remainder went chiefly to the mining areas. A certain amount of rice may possibly make two journeys on the railway but the proportion is not large. In addition to the 2,000 tons which were thus presumably sent to the mining areas by rail, the mines purchase a great deal of rice locally and the Marampa area, where a big proportion of the mining population is employed, is not served by Sierra Leone Railway but by water transport. It is therefore thought that the estimate of 5,000 tons a year is not unreasonable.

17. A Map (No. 1) showing the areas from which upland rice is exported by rail is given at the back of this report. From this it will be seen that as the result of the production of rice as a money crop on upland areas, the vegetation of the area, and consequently the fertility of the soil, has suffered accordingly.

18. *Palm Kernels.*—There was a further fall in the quantity of palm kernels exported in 1938. This was certainly due in part to the fall in prices which discouraged farmers from collecting fruit but it was also probably due, to a less extent, to the very big increase in upland farms in 1937 and 1938. These farms, when they are prepared for cultivation, are brushed and burned and the oil-palms growing in these burned areas receive a setback from which it takes two or three years to recover. I have already warned Government of the importance of preserving the "high bush" in connection with the oil-palm industry and the appointment of an Agricultural Officer for work in high bush area was approved at the November meeting of Legislative Council.

19. The relative values of the high bush and low bush areas for producing kernels are shown in Map No. 2 at the end of this report, the figures obtained from Railway reports showing the tonnage of kernels exported from each station being diagrammatically super-imposed on a vegetation map. The result clearly shows the importance of maintaining a large area of "high bush" if the Colony's chief export is to be maintained.

20. The exports are given below:—

—				Tons exported.	£
Average	1920-29	...	...	58,150	1,024,798
	1930	...	...	56,641	664,591
	1931	...	...	54,462	449,742
	1932	...	...	77,162	687,477
	1933	...	...	64,084	472,824
	1934	...	...	68,655	470,780
	1935	...	...	78,019	583,645
	1936	...	...	84,578	810,238
	1937	...	...	76,776	884,813
	1938	...	...	63,697	457,030

21. The following figures show the areas from which the kernels were exported:—

—		Export from Southern River Area through Bonthe and Sulima.	Export from "Line" Area through Freetown (Railments).	Export of Water-borne Kernels chiefly from Northern Rivers through Freetown.
		Tons.	Tons.	Tons.
1930	...	19,624	27,666	9,351
1931	...	15,356	32,992	6,114
1932	...	23,993	41,933	11,044
1933	...	19,931	33,294	10,859
1934	...	22,114	33,925	12,614
1935	...	23,545	43,106	11,368
1936	...	27,217	44,416	12,965
1937	...	23,693	39,424	13,659
1938	...	19,462	34,024	10,211

22. The price of palm kernels was low throughout the year. Starting at £5 15s. 0d. a ton (Freetown) the price fluctuated but fell steadily till it reached its lowest point, £4 5s. 0d. a ton, at the beginning of August; afterwards the price rose to £4 15s. 0d. a ton and remained at this price, subject to slight variations, until the end of the year.

23. *Palm-Oil.*—The exports of palm-oil were the lowest for many years and this is thought to be due to the same causes which depressed the export of palm kernels. The price of palm-oil is so low that little encouragement is given to small farmers to produce for export.

				Exports.	
—				Tons exported.	£
Average	1920-29	...	...	2,562	81,742
	1930	...	...	3,652	79,310
	1931	...	...	1,359	19,830
	1932	...	...	2,208	26,914
	1933	...	...	1,619	16,637
	1934	...	...	2,225	18,032
	1935	...	...	2,892	35,814
	1936	...	...	1,222	16,303
	1937	...	...	2,325	42,238
	1938	...	...	1,066	16,024

24. *Kola*.—The exports of kola reached the lowest level for many years; the low price and the lack of demand in Nigeria being the cause of this falling off.

The total exports to all countries are shown below:—

				Tons exported.	£
Average	1920-29	...	...	2,932	279,678
	1930	...	...	2,271	186,197
	1931	...	...	1,584	47,847
	1932	...	...	2,085	41,373
	1933	...	...	1,812	43,656
	1934	...	...	1,460	18,304
	1935	...	...	1,859	39,415
	1936	...	...	2,301	41,539
	1937	...	...	2,382	60,504
	1938	...	...	1,450	29,784

25. The trade, however, showed a distinct change owing to the lowering of the French tariff in Senegambia, and by the end of the year, Dakar had superseded Bathurst as the destination of a large proportion of our kolas. To a certain extent the relative amounts of import duties at Dakar and Bathurst determine to which port kolas are sent, and those at Dakar are now lower than those of Bathurst. The lowering of the duties in Senegambia have opened up a new avenue of trade and by the end of the year signs were not lacking that the kola trade was reviving as a result. It is confidently anticipated that exports in 1939 will increase as a result.

26. *Ginger*.—There was a further increase in the amount of ginger exported in 1938, in fact, exports reached the record figure of 2,705 tons. As a result of this large crop, and the large crop in 1937, the price went down heavily in 1938, and the average price for the year was just over £22 a ton f.o.b. compared with £41 the previous year. These two years of high production are expected to reflect adversely on prices in 1939. The area in which ginger is cultivated is shown in Map No. 3 and there is little doubt that the combined cultivation of rice and ginger in the low bush area has been very largely responsible for the degraded vegetation. When annual crops are grown on the same land for two years in succession, the heavy rainfall takes a heavy toll on its fertility, and the tree growth gets a very heavy setback from which it recovers but slowly.

Exports.

				Tons.	£
Average	1920-29	...	...	1,582	56,778
	1930	...	...	1,972	57,228
	1931	...	...	1,927	32,518
	1932	...	...	1,383	22,877
	1933	...	...	1,545	16,543
	1934	...	...	1,659	23,254
	1935	...	...	1,506	36,918
	1936	...	...	1,642	58,672
	1937	...	...	2,384	97,622
	1938	...	...	2,705	60,679

27. *Piassava*.—Piassava was another product which reached record figures for export. 3,791 tons were exported, but the price, like that of other world commodities, showed a fall.

				Exports from all Areas.	£
Average	1920-29	...	...	1,645	22,707
	1930	...	...	2,417	36,582
	1931	...	...	3,150	31,846
	1932	...	...	2,877	23,290
	1933	...	...	3,499	30,108
	1934	...	...	3,659	30,390
	1935	...	...	3,438	30,997
	1936	...	...	3,528	32,776
	1937	...	...	3,392	43,609
	1938	...	...	3,791	40,365

28. Prices for Sulima piassava still remain low compared with Sherbro fibre, but the value of the piassava industry in the Sulima area is greater than that of the Sherbro area and continues to make steady growth. The following Customs figures illustrate this point:—

Sherbro Area.

Year.			Tons Exported from Bonthe.	Value.	Local price per ton.		
				£	£	s.	d.
1930	...	...	663	14,356	21	11	0
1931	...	...	748	10,914	14	12	0
1932	...	...	615	8,440	13	14	0
1933	...	...	1,415	15,232	13	6	0
1934	...	...	852	13,575	15	19	0
1935	...	...	1,096	16,015	14	14	0
1936	...	...	798	11,261	14	1	0
1937	...	...	1,062	21,468	20	1	0
1938	...	...	550	8,435	15	7	0

Sulima Area.

Year.		Tons exported from Sulima.	Value. £	Local price per ton. £		
1930	...	1,754	12,226	7	0	0
1931	...	2,402	20,932	8	14	0
1932	...	2,262	14,850	6	12	0
1933	...	2,354	14,256	6	1	0
1934	...	2,807	16,815	5	18	0
1935	...	2,342	14,982	6	8	0
1936	...	2,760	21,515	7	16	0
1937	...	2,330	22,141	9	10	0
1938	...	2,485	22,504	9	1	0

29. The remainder of the piassava, 756 tons, was shipped from Freetown and as no piassava is produced in the Peninsula, it must all have come originally from either Sulima or Sherbro for re-shipment at Freetown. As 756 tons valued at £9,375 were

shipped from Freetown, the inference is that there were 381 tons of Sherbro fibre valued at £5,982 and 375 tons of Sulima fibre valued at £3,394. On this assumption the production in the two areas was:—

Sherbro ...	...	931 tons valued at £14,417
Sulima ...	...	2,860 „ „ „ £25,898.

30. *Cocoa*.—In a country which relies to such an extent on one crop—palm kernels—it is pleasing to record that the cocoa industry, having been started in the “high bush” country by this Department and by Administrative Officers, now shows definite signs of progress in suitable localities. In the last five years the exports have gone up from 67 to 384 tons and the industry is steadily growing. Moreover, not only do the exports show an increase, but in the “high bush” country the establishing of young plantations is steadily progressing. There is little doubt that given encouragement, advice and transport facilities, the “high bush” area south of the railway would rapidly develop an industry in cocoa. The area available for the growth of this crop is limited but there is no reason why the industry should not expand to 10,000 or even 20,000 tons a year; and although this is a mere flea-bite in the World’s production, it would make a great deal of difference to the Sierra Leone revenue and to the standard of living of the people in the “high bush” country. The appointment of an Agricultural Officer for work in the “high bush” country was approved at the November meeting of Legislative Council (Estimates, 1938) and his advent, and a road from Giema to Zimi, should give a great stimulus to this industry.

Exports.

		Ton exported.	£
Average	1920–29	...	43
	1930	...	80
	1931	...	61
	1932	...	81
	1933	...	67
	1934	...	138
	1935	...	164
	1936	...	301
	1937	...	265
	1938	...	384
			1,475
			2,548
			1,034
			1,295
			990
			1,755
			2,043
			5,542
			8,830
			5,849

31. The necessity for “high bush” to provide the necessary shade and moisture conditions for this crop is shown definitely by Map No. 4 at the end of this report. The map shows the various types of vegetation and superimposed upon it are the railway figures showing the amounts of cocoa railed from each station. The map clearly demonstrates that all the cocoa comes from the “high bush” area and emphasizes the necessity of preserving the “high bush” if a cocoa industry is to be built up.

32. *Coffee*.—There was a falling off in the amount of coffee exported in 1938 compared with 1937, although, even so, 1938 was the second largest export on record. The drop was due partly to lower prices prevailing and partly to the fact that there is an increase in demand for coffee for local consumption. Farmers are still interested in this crop and a small but gradually increasing production is expected. The export figures are as follows:—

			Tons exported.	£
Average	1920–29	...	4	356
	1930	...	5	189
	1931	...	7	237
	1932	...	2	65
	1933	...	3	96
	1934	...	8	247
	1935	...	11	299
	1936	...	13·5	324
	1937	...	58	1,201
	1938	...	38	792

33. *Cattle*.—There was a marked decrease in the quantity of hides exported in 1938. This is due to the fact that 1938 was a bad year financially and people had not the money available to import cattle. The great proportion of the cattle killed in Sierra Leone are imported from French Guinea and any fall in the general financial conditions of the people is at once reflected in reduced meat consumption. The exports for the last ten years are given below:—

Export of Hides.

			Cwts.	£
1929	...	...	876	4,654
1930	...	...	840	2,853
1931	...	...	620	1,687
1932	...	...	540	1,223
1933	...	...	580	987
1934	...	...	440	692
1935	...	...	388	1,156
1936	...	...	603	1,821
1937	...	...	1,281	4,854
1938	...	...	322	1,046

34. The quantities of hides tanned locally and exported and those exported untanned are shown by the following figures:—

Exports.

<i>Tanned Hides.</i>				<i>Untanned Hides.</i>	
		Cwts.	£	Cwts.	£
1935	...	124	770	263	374
1936	...	192	1,197	411	624
1937	...	249	2,029	1,032	2,825
1938	...	44	316	278	730

35. *Beeswax*.—There was a further falling off in the export of beeswax in 1938. The figures are given below:—

			Cwts.	£
1934	...	...	15	65
1935	...	...	37	182
1936	...	...	58	287
1937	...	...	33	175
1938	...	...	31	127

36. *Garden Crops.*—The cultivation of garden crops continues to increase and provides a valuable addition to the food of the people which is still too largely composed of rice. The quantity carried by the railway during 1938 was 3,225 tons. This, while not a record, is still large and is the second largest amount carried by the railway in any one year. This is worthy of note since there was plenty of rice everywhere in the country; the garden crops were being used therefore as adjuncts to the main food crop instead of in place of rice. The figures since 1926 are as follows:—

Year.	Tons.
1926	1,902
1927	2,517
1928	2,297
1929	2,382
1930	2,113
1931	2,746
1932	2,897
1933	2,539
1934	3,938
1935	3,127
1936	3,641
1937	3,087
1938	3,225

37. The Moyamba District still continues to show increases in the cultivation of food crops other than rice and this is shown by the amount railed from the individual stations in the Moyamba District. The railway exports from this district although in no sense a record were definitely larger than those in the preceding year.

Year.	Mano.	Kanga-hun.	Moyam-ba.	Bauya.	Roti-funk.	Brad-ford.	Mabang.	Total Mano-Mabang.
—	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1926	88	65	19	18	93	33	61	379
1927	122	84	44	35	159	50	97	591
1928	115	46	45	53	51	24	29	362
1929	104	52	56	22	77	12	29	352
1930	114	74	51	32	130	51	14	466
1931	175	96	130	31	197	77	99	805
1932	417	89	112	37	366	61	72	1,154
1933	295	85	89	37	295	59	59	929
1934	782	313	242	141	140	261	134	2,013
1935	603	151	241	185	150	237	197	1,764
1936	510	239	224	259	206	385	360	2,183
1937	308	197	166	365	139	205	371	1,175
1938	457	234	241	187	146	208	214	1,687

SECTION II—WORK OF DEPARTMENT OF AGRICULTURE, 1938.

AGRICULTURAL SURVEY AND PROPOSALS FOR DEVELOPMENT.

38. A definite advance was made in the work of the Agricultural Department in 1938. During the year there was sufficient staff in the Colony for two long-deferred surveys to be carried out. The whole of the Colony Peninsula was surveyed by Mr. H. Macluskie while the southern area of the Moyamba District was surveyed by Mr. G. M. Roddan with a view to investigating the possibilities of swamp cultivation along the rivers leading into Yawri Bay; in the large areas of swamps behind these rivers (Moyamba District); and in the swamps bordering the Bagru Creek (Sherbro District). The results of these two agricultural surveys were published in Sessional Papers Nos. 7 and 8 of 1938.

39. The report of Mr. G. M. Roddan, who carried out the survey of swamps in the Moyamba District is very instructive, it shows that:—

- (i) Over 100,000 acres of suitable swamp land are untouched in the eastern part of the area and of this nearly 68,000 acres are mangrove swamps. The possibilities of development in these areas are therefore enormous.
- (ii) The tree vegetation on the dry land areas has degenerated to such an extent that the need for immediate steps to arrest further rapid deterioration cannot be too strongly stressed.
- (iii) The production from the swamp area already under cultivation can be considerably increased by the judicious introduction of improved strains of rice.
- (iv) Production can be increased from the area under cultivation by the introduction of farming methods which have proved beneficial in the Scarcies, including the introduction of tools suitable for the various operations.
- (v) Large areas of grass lands are suitable for cultivation with the plough. It is, however, noted that any innovation of this kind must be proceeded with very cautiously.
- (vi) The development of the vast uncultivated areas suitable for swamp rice is urgently needed if the general vegetation on the upland areas is to be saved from the rapid deterioration caused by over-farming of "bush".

40. Mr. Roddan recommended that:—

- (a) an Agricultural Officer should be permanently stationed in this area, based on Sembehun, with the primary object of developing the cultivation of swamps;

- (b) Government should make loans to intending wet-land farmers for the purpose of clearing mangrove swamp;
- (c) experienced mangrove fellers be obtained from the Scarcies to teach their craft;
- (d) an Agricultural Station be opened at Sembahun to act as a demonstration farm and as a centre for producing seed for that area;
- (e) farmers from the Sembahun area should be given an educational trip in the Scarcies area in early December.

41. Government has approved of the recommendations of Mr. Roddan and I am very glad to report that before the end of the year an Agricultural Officer (Mr. Roddan himself) was stationed at Sembahun and had taken over and started work on an area designed to become the Sembahun Rice Station. He acquired the services of experienced mangrove fellers and started work in the Bagru Creek and provision was obtained for £500 to be loaned during 1939 to farmers in the Moyamba District for the purpose of felling mangrove and clearing swamp farms. The terms of these loans include repayment over a period of years with a very moderate interest of $2\frac{1}{2}$ per cent. but with this incentive that if the money is completely repaid within four years of issue no interest will be charged. Moreover, with the co-operation of the District Commissioner and the Tribal Authorities, arrangements were made to register the ownership of these newly cleared swamp lands; and before the end of the year, and before the money was actually available, farmers were already registering their names with the Agricultural Officer for clearing swamp farms.

42. This can only be regarded as an extremely neat and comprehensive bit of work carried out systematically and expeditiously; and this could not have been accomplished if an officer had not been available to give his whole time to making a detailed agricultural survey. Further, the officer concerned was able to draw upon the experience which the Department had already gained in the Scarcies area, an area very similar in many respects to areas along the Bagru Creek, and without this experience he would not have been in a position to make many of his recommendations. This experience, however, enabled him to make specific recommendations with regard to the area surveyed, and there is little doubt that development can now proceed steadily for many years. When it is realised that this area is in the region of 100,000 acres and should be able to produce at least 50,000 tons of rice annually, a quantity which would go far towards settling the question of maintaining an adequate rice supply for Sierra Leone without encroaching too severely on upland areas for rice farms, the importance and permanence of this station will be fully understood.

43. The agricultural survey of the Colony carried out by Mr. H. Macluskie was equally comprehensive. It enabled a definite programme of work to be drawn up for the Colony

Peninsula and work has already started along the lines suggested. The possibilities of development are not so large as in the Moyamba District and the main points of the report may be summarised as follows:—

44. The Colony Peninsula can be divided into two distinct and different types of agricultural land:—

I. THE HILLY AREA IN THE WESTERN HALF OF THE PENINSULA;

This consists of:—

- (a) Steep slopes of lateritic gravel on hill slopes which have been over-cultivated and worked out. This land supports at intervals poor crops of cassava; erosion is very severe and these slopes would be better under forest. This type of land comprises over 90 per cent. of the cultivated area.
- (b) Small patches of fairly level land in valleys among the hills. These are fertile and are cultivated for vegetables in the dry season. These areas do not in the aggregate exceed 5 per cent. of the total cultivated area in the western part of the Peninsula; they might be improved by drainage and/or irrigation.

II. THE LOW-LYING FLAT AREA IN THE EASTERN HALF OF THE PENINSULA.

This consists of:—

- (a) Large undulating areas of sandy soils of low fertility, used mainly for growing cassava.
- (b) Extensive inland swamps suitable for rice and vegetables.
- (c) A large extent of partly tidal swamp land suitable, when empoldered, for growing rice.

45. The total area of soil suitable for cultivation in the eastern half of the Colony Peninsula is considerable and it is from this area that the larger agricultural developments must come. It is not possible, however, to neglect the demands for agricultural improvement in the western part of the Peninsula and in the scheme drawn up for the future development of agriculture, the mountain villages around Freetown will receive special attention and every effort will be made to find a suitable site or sites for an experimental station in the mountain area. The proposed programme of work in the eastern half of the Peninsula includes the improvement of swamp cultivation, especially in areas where it is possible to empolder suitable swamp lands to keep out the sea water during the growing period. In this connection a start was made in 1938 and a small experimental area empoldered. A good crop of rice was not obtained—possibly

the right variety has not yet been found—but what was of special interest was an almost complete change of vegetation within the empoldered area brought about during one season only. It was strikingly obvious from quite a distance that there had been some change in soil conditions and vegetation due to empoldering and this was shown up by the different colour of the vegetation and the types of weeds which sprang up on the empoldered area after the rice crop had been removed. It is possible that the land will have to be empoldered for more than one year (probably a reduction in salinity is necessary) before a good crop of rice can be expected.

46. A survey of the Bullom area (between the Scarcies and Freetown) was commenced by Mr. R. R. Glanville but had not been completed by the end of the year; the object, as in the other cases, is to put up, in the light of a detailed examination of the agricultural conditions, proposals for developing the area. These proposals should be forthcoming in 1939.

47. A survey of the cattle industry was commenced in 1938 by the Livestock Officer the chief points of which are given in his report attached hereto. The cattle are like those of French Guinea and rather like a smallish Guernsey. They appear to have some immunity to trypanosomiasis and they appear to offer considerable possibilities for improvement. There is a very small proportion of cows to bullocks and bulls. This is due to the fact that cattle are imported only from French Guinea and apparently only male animals are allowed to be exported from that country. The same proportion has been noticed with regard to sheep.

48. An investigation of possible sites for the establishment of a cattle farm was made by Mr. Roach, assisted, so far as fodder grasses were concerned, by Mr. F. C. Deighton. In Sierra Leone this is a matter which cannot be accomplished in a short space of time. We have seven very wet months followed by very dry conditions in the remaining five months, and an area which may appear suitable at the end of the dry season may be inundated by 5 feet of water towards the end of the wet season. It is therefore necessary to select an area which is sufficiently watered or can be irrigated during the dry season, or sufficiently dry or can be drained in the wet season. Moreover, it is necessary to ascertain that such an area can carry grass of a type suitable for fodder and for making hay. By the end of the year suitable sites had been found and a final checking-up at the end of the next dry season (April 1939) before a final selection is made, is all that is required.

49. All our work during the last few years has pointed to the fact that although this country has a heavy rainfall, the question of irrigation and drainage is of major importance in the future development of agriculture. Unfortunately, this country cannot afford to carry out all the investigations it would like to make and an application was made to the Colonial

Development Fund for a grant to assisting in obtaining the services of an experienced Irrigation and Drainage Engineer to survey swamp areas, and to put up proposals and supervise schemes for developing swamps by some form of water control where such is necessary and economically sound. This, it is hoped, will lead to the systematic development of many thousands of acres of uncultivated swamp lands under conditions of agriculture which will conserve the fertility of the soil and relieve this Colony for ever of the twin bogies soil deterioration and sub-nutrition. In this connection, I should like to quote Sir Frank Stockdale's report on Malaya (*loc. cit.* p. 27) where similar conditions prevail. He said:—

“ The results of the work of the Drainage and Irrigation Department since its creation in 1932 have exceeded expectations and the Department of Agriculture by the improvement of its organisation for the paddy growing industry has made it possible for material progress to be made ”

The same progress is possible in Sierra Leone—all that is needed is the necessary money for development.

50. It is impossible to leave this section of my report without drawing attention to our experience with and the possibilities of developing tree crops. In my last two reports I have called attention to cocoa but now I want to call attention to the whole of our tree crops. Since I took charge of the Department in 1933 it has been the policy of the Department to encourage cocoa in the high bush area (and in this area only) and coffee where suitable shade exists. The following figures indicate how the two crops have been developed:—

			Cocoa.	Coffee.
			Tons.	Tons.
1933	...	...	67	3
1934	...	...	138	8
1935	...	...	164	11
1936	...	...	301	13.5
1937	...	...	265	58
1938	...	...	385	38
1939 (estimated)	...	...	(550).	(45).

51. While these developments are still small they indicate the possibilities of tree crops. Moreover, the chief agricultural exports, with the sole exception of ginger, are tree crops, namely, palm kernels, kola and piassava. Cocoa, coffee and kola all require shade and the preservation of the existing high bush is essential if native cultivators are to be encouraged to grow tree crops under natural shade. In this connection the establishing of artificial shade trees is a long and wearisome business and it has been found by experience that good crops can be grown under natural shade trees.

NORTHERN PROVINCE.

52. Mr. R. R. Glanville, M.B.E., was in charge of the Province throughout the year and was stationed at Rokupr until November 11th when for health reasons he was transferred temporarily to Makeni. This necessitated the posting of Mr. E. I. Nisbett from the Southern Province to Rokupr to supervise the work in the Scarcies area. Mr. E. S. Garner was stationed at Rokupr until November 7th when he went on leave and Mr. A. F. MacKenzie was transferred from the Southern Province to Rokupr to take over Mr. Garner's duties.

53. The total rainfall for the year was normal in amount but there was an unusual distribution. Late June and early July were drier than normal but the rains continued much longer than usual, heavy falls being experienced until late in November. These weather conditions were conducive to good burns and the crops on the upland farms were better than normal.

 UPLAND CROPS.

54. *Rice*.—The upland rice crop was definitely heavier than normal.

55. *Fundi*.—This crop which is so important in the Northern Province was also satisfactory.

56. *Groundnuts*.—Production was slightly below normal owing to a decrease in the area planted.

57. *Maize*.—The maize crop was particularly good.

58. *Root-crops*.—The areas under cassava, sweet potatoes, and yams were slightly increased.

WETLAND CROPS.

59. *Rice*.—The area under wet-land rice was still further increased and it is estimated that production was slightly above previous years although some damage was done by the exceptionally high floods experienced in early September.

60. Taking everything into consideration the total food production was undoubtedly the highest that has ever been reached and there was no scarcity of food at any time during the year. It is gratifying to note that throughout the whole of 1938, a bad year for trade, with the price of kernels at a very low level, the amount of food produced and consumed by the people was probably larger than ever before.

PESTS AND DISEASES.

61. On the whole the area was markedly free from infestation of major pests and diseases.

62. *Locusts*.—The incidence of locusts was the lightest since the present invasion cycle began. A few isolated swarms occurred in the northern districts during the first part of the year but the damage to crops was negligible.

63. *Cattle Fly*.—Deaths of cattle due to “fly-worry” by *Stomoxys* were apparently fewer than usual.

64. *Piricularia*.—As a result of the unusual dry weather experienced in June and July, *Piricularia* was abnormally severe in the Scarcies rice nurseries; G.E.B. 24 nurseries suffered most and the area subsequently planted to this variety was less than it otherwise would have been.

65. *Citrus Scab*.—The campaign to eradicate scab on citrus was continued, and by 1939 it is believed that the province will be free from this disease.

WORK WITH RICE.

66. Rice is the chief crop dealt with in this area and a separate report on the Rokupr Experimental Station is attached (Appendix I to this report). The programme of work has been a continuation of that of previous years, namely:—the improvement of local varieties by pure line selection; the introduction and control of new varieties from other countries; the multiplication and distribution to farmers of those types which have been proved to have an advantage over local varieties; and the investigation of certain cultural methods.

67. The rice distribution scheme which started in 1935 still continues to be a great success. In the Scarcies area 1,854 bushels of seed were distributed to 761 farmers, an increase over the previous year of 190 bushels of rice and 155 farmers. The Revolving Seed Scheme, which makes this large-scale distribution possible, is working very satisfactorily and no appreciable trouble has been experienced in collecting seed after harvest in repayment of loans. The standard of purity of wet-land seed is still reasonable but the amount of pure seed available for distribution from the Experimental Farm at Rokupr is very limited and recommendations have been made to increase supplies by having a separate seed farm for the multiplication of pure seed. By this means it is planned to place annually in circulation a certain amount of pure seed and this, it is hoped, will assist in maintaining the purity of the rice in the district. At present there is a tendency for pure lines to be mixed after they had been distributed for three or four years, and it is essential to have a seed multiplication farm where pure seed can be produced until such time as the farmers are educated to the point of preserving their seed in a purer form.

68. The chief rice distributed is G.E.B. 24 and on account of its high quality this rice continues to fetch a considerable premium in the local market. It is also suitable for export. Unfortunately it is susceptible to *Piricularia* during the nursery

stage if conditions are unfavourable, and arrangements have therefore been made to increase distribution of other varieties which, although possibly are not quite so high in quality, are at any rate not so susceptible to *Piricularia*. Among these varieties are Co. 7 and Kavunginpoothala. Other promising varieties include No. 79, Ngasein, and Rokupr selections of Toma, Lal and Bis. These varieties are being multiplied and will soon be available for general distribution.

69. The object of this work is to have a series of high yielding, good quality rices which will provide rice suitable for all the swamp conditions found in Sierra Leone. The series under cultivation during 1938 range from short to long crop duration periods so that the rice harvest may be spread over a longer period and farmers with limited labour resources will be able to handle their crops more advantageously.

70. The distribution of seed rice was not confined to the Scarcies area and outside this area 368 bushels of wet-land rice were distributed in the Northern Province on the loan system to 250 farmers. G.E.B. 24 which constituted the bulk of the seed continued to do well in inland swamps and it is very popular. Kavunginpoothala has proved successful and there is no doubt that this variety will prove particularly valuable for more deeply-flooded inland swamps, it is not recommended for the drier sandy types of swamp as under such conditions it appears very susceptible to *Helminthosporium*. The area under wet-land rice continues to increase steadily year by year and in view of further possible expansion, we are making trials with salt-resisting strains in saline areas.

71. *Trial of Rice in Salty Areas.*—A small plot of cleared mangrove swamp was taken over at Pepel for the purpose of testing the incidence of salinity in that area. There is a considerable area of fertile mangrove swamp but as yet no farmers have succeeded in growing rice so near the mouth of the river owing to the very saline conditions. Three varieties of rice were tested, two of which were more than normally tolerant to salinity. No empoldering was done. The rice was planted on July 15th and on August 15th. In all cases the rices were a failure. The rices thrived until the end of October when they began to suffer and by the end of November all the rices had been killed off without yielding a crop. With the kind assistance of Captain Ridley, the Pilot of the Sierra Leone Development Company at Pepel, it was possible to arrange for the collection of water samples in the river at high tides—the time when the water is most saline. The results were as follows:—

Date.				% Salts.
April 30	...	...	...	3.38 Very saline to taste
May 31	...	...	...	3.13 Very saline to taste
June 30	...	...	...	2.26 Very saline but noticeably less

Date.	% Salts.
July 29	1.58 Very brackish
August 26	0.86 Slightly brackish
September 24	0.55 Almost fresh to taste
October 23	0.98 Slightly brackish
November 9	1.18 Brackish
December 8	2.00 Definitely saline.

72. Assuming that these conditions were not abnormal, the results of these preliminary tests indicate that without resorting to empoldering it will not be possible to grow rice at Pepel or elsewhere where similar conditions are to be found and that even the so-called salt-resistant varieties are not an economic proposition. An empoldering trial will therefore be made, if possible, in 1939.

73. In addition to rice work, activities on the Rokupr Experimental Station have been extended to include the following:—the maintenance of garden and upland farm crops, such as yams, early cassava, Kono groundnuts, ginger, Canary bananas, sugar canes, pineapples and chillies; and planting material of all these as well as seedlings of oil-palm, cocoa and coffee were raised and distributed to farmers. Further, a pen of Rhode Island Red fowls was maintained and eggs sold to local farmers for hatching purposes.

74. *Yams*.—Of all annual crops other than rice, the biggest demand for seed has been for yams, chiefly the Yellow and Jaffna varieties, and 3,422 lb. were distributed to some 122 farmers. The increase of the area under yams as a result of seed assistance for planting material is most striking.

75. *Cassava*.—The distribution of planting material of early cassava has also been continued and the recent use of swamps for cassava in the dry season is spreading rapidly and will soon provide an important addition to the food supply.

76. *Coffee*.—Considerable interest is still maintained in Robusta Coffee particularly in the Bombali and Tonkolili Districts which are close to the Magburaka-Roruks section of the railway line. The quantity marketed from this area was over a ton and the production is expected to increase rapidly as new plantations come into being. Buying is in the hands of the Syrian traders who pay 3*d.* to 4*d.* a lb., a price which the producers find very satisfactory. During the year 123 nurseries and seventy-two small plantations were established under the direction of this Department.

77. *Oil-palms*.—The demand for assistance in making oil-palm plots also continued and thirty-seven plots containing 1,230 palms were made under the supervision of the Agricultural Instructors.

78. *Fruit Trees*.—The demand for planting material of fruit trees still continues and in view of the importance attached by the Medical Department to the increase of fruit in the diet, this is a promising sign. 152 fruit trees of various kinds were distributed and in addition, 442 banana suckers and 304 pineapple plants.

79. *Ploughing*.—Ploughing continued to make progress in the Mabolé valley in the Bombali District in spite of the death during the year of the two pioneers. During 1938, eight ploughs were in use and it was estimated that about 100 acres were under plough. The ploughed areas are level river flats and there is little danger of erosion. Other farmers have indicated their wish to purchase ploughs in 1939 and there appears little doubt that the use of the plough, under certain conditions, could be successful in Sierra Leone if sufficient time and attention could be devoted to the necessary investigational work by an Agricultural Officer. Actually, an application has been made to the Protectorate Mining Benefits Fund for a grant to assist in the systematic development of all inland valleys and swamps including the use of ploughs and the introduction, if possible, of mixed farming. As soon as funds become available this form of development can be systematically tackled.

80. *Co-operation*.—The Farmer's Societies mentioned in my last Annual Report have continued to function satisfactorily, and a new society has been started at Rokupr. Good progress was made and the Mambolo and Kichom Societies marketed 9,015 bushels of paddy during the 1937–1938 season as compared with 1,950 bushels from the Mambolo Society, the only one in existence, during the 1936–1937 season. The bulk of the paddy was cleaned at the Government Mill in Freetown and sales arranged from there. Of the 9,015 bushels sent to the mill, 6,575 were G.E.B. 24. On the whole the quality was well above the average for the Scarcies and the net prices realised by the members of the societies averaged 2s. 8d. per bushel with extremes of 2s. 4d. and 3s. 3d. Although the prices were not quite so high as expected the members were pleased with the results and of the sixty-six farmers participating not one wished to withdraw his membership. The assistance afforded by Government was appreciated and they realised that with the increased production throughout Sierra Leone, they stand to profit by organized marketing, especially where rice of a quality suitable for export is concerned. In this connection, the Mambolo farmers approached the Director of Agriculture during his last visit to Mambolo to ask him if he could not investigate the possibilities of exporting a quantity of rice to foreign countries in order to relieve the home market of the surplus supply which was depressing the price of rice unduly. A visit to the Gambia was arranged and although it did not take place before the end of 1938, it is pleasing to record that before this report went to press a visit had been paid to Bathurst and arrangements made for the trial shipments of specified qualities of rice to the Gambia.

81. At the end of the year the membership and reserve funds of the three societies were as follows:—

Society.	Membership.	Reserve Fund.		
		£	s.	d.
Mambolo (3rd year)	...	23	4	2
Kichom (2nd year)	...	13	17	4
Rokupr (1st year)	...	1	10	0

SOUTHERN PROVINCE.

82. For the first time for many years two officers were present in the Southern Province for the greater part of the year, and, although there were many changes of staff owing to leave, it was possible to undertake something more than the normal routine work of the station and extension work in the vicinity. This "something more" included the systematic survey of the swamp areas in the Moyamba District and an account of the result of this survey was published in Sessional Paper No. 7 of 1938 and has been referred to already in paragraphs 39 to 42 above. The officers in charge of the province for the greater part of the year were:—Mr. J. W. D. Fisher during the first half and Mr. E. I. Nisbet during the second half.

83. The weather conditions were normal throughout the greater part of the province, the rainfall at Njala being only very slightly above the mean of the previous twelve years. In certain districts March rains were slightly heavier than normal and threatened to impair farming operations but no serious interference with burnings was experienced. Most districts experienced fairly constant rains till late in the year, and then almost complete cessation with immediate dry season conditions and harmattan winds blowing very steadily.

PESTS AND DISEASES.

84. No disease or insect pests of major importance was observed during the year. A few isolated swarms of locusts were reported, but there were no reports of hoppers.

85. The Livestock Officer investigated one or two cases of "Fly-worry", a condition which may cause considerable distress and loss amongst cattle; the "Fly-worry" was due to attacks by swarms of a species of *Stomoxys* fly.

CROPS.

86. *Rice*.—Rice was always plentiful, good stocks from the 1937 harvests being augmented by further supplies in September when the new upland crop first came on the market. This very naturally resulted in low prices. Clean rice never rose above 6s. 6d. a bushel in any part of the province and at Mano the price fell as low as 1s. 9d. in September.

87. Satisfactory progress can again be reported on the extension of wet-land rice cultivation, more particularly in the eastern districts (Kailahun, Kenema, Kono and Bo). G.E.B. 24 was again in demand and 150 bushels were distributed to 119 new farmers. Farmers to whom this variety had been distributed in previous years are continuing to plant it. The crops on the whole are satisfactory and the farmers are very pleased both with the quality of the rice and the yields obtained.

88. *Ginger*.—The ginger crop was the largest ever exported and although the price was not as high as in 1937, farmers were fairly satisfied with the results. 2,705 tons were exported, an increase of 321 tons over 1937 shipments, and this, it is thought, is more than the market can readily absorb and will reflect adversely on prices in 1939.

89. Investigations into the ginger crop are being started with a view to seeing if it is possible to introduce better varieties, better methods of preparation or better methods of marketing. The local ginger has been separated into three distinct types:—white, red and black and an enquiry has been started into the possibilities of introducing co-operative methods among the farmers.

90. *Cocoa*.—The extension of cocoa cultivation in the “high bush” areas of Pujehun, Kenema and Kailahun Districts is going ahead in the absence, at the present time, of any particular assistance—other than moral encouragement—from this Department. The effect of the past work of the Department, some eight to ten years ago, is reflected in the rising figures for exports of cocoa and in 1938 a record figure of 384 tons was reached. The need for further Agricultural Officers to undertake work in the “high bush” area is already urgent. At present, with the meagre staff of Agricultural Officers available, it is impossible to spare one for work in this area; all that can be done is to pay fleeting visits to the area and endeavour by means of the small staff of Agricultural Instructors to encourage farmers to keep their plantations clean, to ferment their beans properly and thoroughly dry their cocoa before selling it. In this “high bush” area there is a very definite possibility of establishing cocoa and building up a small but important export industry in this crop; and although the total amount of cocoa would never be very large it would at any rate be of considerable service to the native cultivators in this particular area, and a decided and very necessary addition to revenue. I cannot too strongly press upon Government the necessity of developing this industry while it is yet possible. If neglected too long, and the farmers instead of cultivating cocoa cultivate rice as a money crop, the vegetation of the “high bush” area will rapidly be ruined and it will no longer be possible to establish a cocoa industry.

91. In a country like Sierra Leone, where the need for tree crops on upland areas is very pressing in view of the nature of the climate, the existence of such a crop as cocoa affords a solution to agricultural development in the limited area where “high bush” still persists. Unless something is done to preserve the “high bush” in the near future another agricultural opportunity will be lost to Sierra Leone.

92. *Coffee*.—The Department during 1938 continued supervision of the coffee plantations already started and was of assistance in the preparation of the berries for the market. Interest is still taken in this crop.

93. *Citrus*.—Efforts to eradicate citrus scab in the Southern Province continued and except in one or two centres the Province is now free. At Njala, investigational work on grapefruit still continues and a recently established plantation of locally selected Marsh grapefruit is now coming into bearing. Canning trials with fruit in different stages of development were carried out. These trials in 1938 were of a preliminary nature but they have enabled us to adopt certain methods which appear suitable in Sierra Leone and they will form a basis for further investigations in 1939.

94. *Garden Crops*.—There has been a further increase in the cultivation of garden crops in the Moyamba District in spite of the fact that the rice was plentiful. This increase is reflected in the quantities railed from stations in the Moyamba District compared with last year's figures. Practically all the seed of the material thus exported came originally from the Njala Agricultural Station and it is gratifying to note that as a result of the seed obtained from Njala, and the methods of cultivation seen and practised there, the surrounding district has automatically become the chief vegetable producing district in Sierra Leone.

95. *Poultry*.—The schemes for the improvement of poultry started at Gbenderu, Sefadu Barracks and Kinsi are progressing satisfactorily, but it appears that a certain amount of attention is required in order to induce villagers to pay more care and attention to the pure bred cockerels.

96. Rhode Island Red stock continued to be reared at Njala and both breeding stock and eggs were distributed on payment from that centre.

97. *Livestock*.—Throughout 1938, the Livestock Officer was stationed at Njala and carried out a number of tours both in the Southern Province and the Northern Province with the object of investigating the livestock industry and settling upon a site for establishing a Stock Farm. This work is reported in Appendix VII. In addition to these tours of investigations small herds of cattle and sheep were established at Njala and experience was gained with regard to the care and maintenance of stock under the widely varying conditions of the wet and dry seasons.

98. *Njala Research Station*.—The report of this station is attached as Appendix II, oil-palms being treated separately in Appendix VI.

99. The work on this station was of necessity curtailed owing to the large building programme which resulted from the transference of the headquarters of the Agricultural and Forestry Departments to Njala; and the building of accommodation not only for the staff transferred but for the Training College (see paragraph 133) whose quarters and classrooms in the permanent buildings were taken as offices and stores by the headquarters' staff. The buildings erected under the supervision of the

Department included houses for fifteen clerks, instructors, etc. for the Agricultural and Forestry Departments; dormitories, classrooms and dining room for thirty students; various stores and shelters for stock. A foreman from the Public Works Department was very kindly lent for a period of about two months and this was a great assistance. The houses were not fully erected in 1938 but most of them were started before the end of the year.

COLONY PENINSULA.

100. Mr. H. Macluskie was in charge of the Colony Peninsula throughout the year, and, as mentioned in a previous paragraph, duly completed his survey of the agricultural possibilities of the Peninsula. This survey was published as Sessional Paper No. 8 of 1938 and has been commented on earlier in this report.

101. Normal weather conditions were experienced throughout the year except that at the close of the season the rains were more protracted than usual.

102. Cassava still continues to be the crop most widely grown in the Colony, and it is, in fact, the only annual food crop which will grow on many of the over-cropped, eroded, and infertile slopes of the Colony hills. The yields obtained are poor on the average, and the crop is much affected by mosaic.

103. Rice is the crop of next importance and is engaging more and more attention especially in the swamp area of the eastern half of the Colony Peninsula. Considerable assistance was given by this Department to rice farmers and over 200 bushels of seed were distributed in 1938. Very little disease was noticed among seed farms except for some discoloration (probably *Piricularia*) in the G.E.B. 24 nurseries. This proved to be a temporary condition and very quickly disappeared, after transplanting. The demand for seed rice was particularly great, especially in the case of G.E.B. 24 rice. At Salt Pan this variety was introduced for the first time in empoldered areas, and promises to be in great demand not only for its high yield but also for its quality. Kavunginpoothala did very well in deep water and inland swamps but it is a rice with a long period of growth and its popularity will probably be limited to the deeper flooded areas. Of the other varieties grown, Toma was most popular.

104. *Observation Plots.*—Two sites were chosen which hitherto had not grown rice—an acre of inland swamp near Newton and three acres of tidal swamp at Maswari; the latter was empoldered.

105. In the inland swamps D.C. rice and Kavunginpoothala were planted. The former was not a success but the Kavunginpoothala gave a good crop especially in the deeper parts of the swamp near the stream.

106. In the empoldered swamp near Maswari, two empolder dams were built, a road being used as the third. The area, which was covered with sedges, was cleared early and the rubbish burnt and used on the nursery beds. Rice was transplanted on the empoldered area. D.C. and G.E.B. 24 matured in 5 months and produced excellent growth during the first part of the season, but in October the road dam proved ineffective and the crop was adversely affected by over-flooding. It is fairly obvious, however, that where areas of this kind can be successfully empoldered they can grow a good rice crop and it would appear that the land can be reclaimed in a year. The salt grasses or sedges are killed out in one season and their place is taken by a totally different flora which requires fresh water conditions. In the area under experiment, water control is fairly easy, since surplus water can be easily drained off at low tide; and, with a normal rainfall, there is no fear of the empoldered area being so dry at the end of the season as to cause loss of crop.

107. This preliminary work with rice in empoldered areas is of the greatest significance. It opens up a new field of development and one which by its very nature avoids one of the greatest difficulties of upland cultivation in this country, namely, soil erosion. It is probable that many thousands of acres of this type of land exist, but without a proper survey it is impossible to give reliable figures.

108. *Coffee*.—In the eastern half of the Colony there has been a demand for coffee and plants have been distributed to a number of villages. These villages have hitherto grown kola, but in view of the low prices which are now offered for kola, coffee is attracting attention.

109. *Citrus*.—Owing to the energies of Agricultural Instructors the citrus trees of the Colony are practically free from "scab." Propaganda for the destruction of "scab" will be continued until it is totally eliminated.

110. *Bananas*.—An interesting banana growing development is taking place near Songo on the Protectorate boundary. A Syrian planter has cleared and drained eight to ten acres of swamp land, cultivated it to a depth of 4 feet, levelled it and planted bananas. On the surface of the soil he has placed a layer of leafy branches brought in from the surrounding bush and this in turn is covered with a deep layer of grass. Under these conditions the bananas have grown extremely well and by the end of the year the plants were beginning to flower; the first bunches are expected to be ready by April, 1939. So far as can be seen, these plants are healthy and vigorous and promise a good crop.

111. *Pineapples*.—The chief work during the year was the propagating of four varieties of pineapples, namely, Red Spanish, Smooth Cayenne, Queen and Baronne de Rothschild. Suckers and discs were used, and in March a new method of propagation was introduced. This consists in cutting pineapple stems longitu-

dinally into slices instead of traversely into discs. These slices are treated with permanganate of potash and placed flat and uncovered on the surface of nursery beds made up of soil enriched by humus; they are then pressed firmly into the soil. The dormant eyes quickly swell and germinate and within a few weeks young plants can be removed, together with a piece of the parent stem, to other nurseries to await transplanting to the field. Using this system seventeen plants were raised per stem in the case of Queen pineapples, and in the case of Smooth Cayenne, a type notorious for its reluctance to produce suckers, as many as eight per stem were raised.

112. *Mangoes*.—Mangoes of the following varieties have been imported:—Julie, Ceylon, Peters, Devine. They have been successfully established, and seedling mangoes are being raised in the nursery for future budding. Already an encouraging measure of success has been obtained by budding from good varieties (names unknown) originally imported from India.

113. *Cashews*.—The trees in the experimental plot at Newton continue to make good growth.

114. *Vegetable Gardens*.—The cultivation of vegetables still continues to engage the attention of farmers in the mountain villages where market gardening is a thriving minor industry. Only a small area of land is suitable for this type of farming and all available land appears to be already under cultivation. Assistance is being given by the introduction of better types of vegetables and it is possible that this industry might also be improved by water control in the swamps where vegetables are grown.

115. *Departmental Stations in the Peninsula*.—The two small stations at Cline Town and Newton were continued. Newton deals chiefly with tree crops and the Cline Town Station includes small annual food crops. A lot of useful information is being collected with regard to leguminous crops and of those introduced, Black Eye cow pea, Lima climber, Waby climber, Pebyugale and Pegya not only give edible beans or pods but form good cover crops. So far these have only been grown on a small scale but the possibility of an edible bean giving a cover crop is not being over-looked.

116. *School Gardens*.—The Agricultural Officer worked in close co-operation with the Education Department during the year and assistance was given at the following schools:—Songo, Wellington, Kissy, Regent, Wilberforce, Murray Town, Goderich, Hamilton, York, Kent and St. Anthony's Brookfields. Great interest was shown and good progress was made.

117. *Agricultural Society*.—The Sierra Leone Agricultural and Commercial Society held its usual annual show in the Wilberforce Memorial Hall during March. The show was a great

success and it was pleasing to note the gradually increasing quality in the vegetables exhibited. There was the usual rush to buy the winning exhibits at the close of the show which indicates that good vegetables are appreciated and command a good price.

RICE MILLING.

118. The Rice Mill at Cline Town had its most successful year so far. It was only started in 1936 and the following figures for the amounts of rice cleaned show how successful this development is likely to become:—

Year.		Rice cleaned Bushels.	Profit.
1936		11,823	47
1937		29,470	55
1938		39,232	267

119. The amount of profit has not always varied strictly in accordance with the amount of rice cleaned, since charges in the cost of electric current have varied considerably during this period. The present charges are on a more satisfactory basis and not likely to increase, so that last year's working shows more clearly what profits may be expected. In this connection it must also be realised that the mill was not working to capacity throughout the year and it is confidently expected that increased quantities of rice will be cleaned and that the 50,000 bushels mark will be passed in 1939, when the extra turnover should add materially to the profits.

120. There is little doubt that consumers very greatly appreciate properly cleaned rice and there is always a premium obtainable for rice cleaned in the mill. Moreover, a much better and more uniform product can be obtained and the housewife can procure rice ready to cook without further cleaning. It is sometimes assumed that milled rice has of necessity lost most of its nutritive value. More arrant nonsense cannot be imagined. The cleaning of rice consists, apart from hulling (removal of outer husk), in removing the pericarp (sometimes red, sometimes white in colour) from the grain either in part or in whole. The degree to which this can be done in an up-to-date mill can be regulated with considerable precision and the mill thereby becomes a means by which rice, containing just that amount of pericarp which the nutritionist considers necessary, can be placed on the market. The Rice Mill at Cline Town, for instance, supplies the Government Prisons in Freetown and Gambia with rice cleaned to the degree to retain just that proportion of pericarp specified by the medical officers in charge of these institutions.

121. It might be thought that if the pericarp were the nutritious part of rice it might *all* be left on the grain. This cannot be done as rice insufficiently cleaned results, in local patois, in "pain for belly"; and, very rightly, no amount of propaganda will induce consumers to eat rice until it has been cleaned to a certain minimum amount. More information on this point is desirable,

122. The average recovery during the year of rice from paddy was 65·5 per cent., while the re-cleaning of native cleaned rice resulted in a loss of weight of 8·1 per cent. The recovery of 65·5 per cent. from paddy is regarded as very satisfactory.

123. Losses due to shrinkage in store amounted to ·77 per cent., a percentage which many merchants must envy, and this was due to the dry condition in which rice was received and the comparatively short time most of it had to stay in the mill store.

124. The average consumption of electricity was 0·32 units per bushel of 60 lb. paddy.

125. The accounts are given in detail in Section III—Finance.

126. The mill was run throughout the year by Mr. R. D. J. Macauley, Sub-Inspector of Produce, Grade II, under the general supervision of the Agricultural Officer, Colony, and it is with pleasure I place on record my appreciation of his good work. Mr. Macauley was promoted to Mill Manager on 1st January, 1939.

PRODUCE INSPECTION.

127. The work of Produce Inspection proceeded normally throughout the year and the Report of the Inspector of Plants and Produce is attached as Appendix III.

128. The report shows that a careful watch is kept on produce and that the standards to which we work are being maintained. The number of convictions obtained in up-country stations was 118 while that obtained at ports of export was 19. This shows that a determined effort is being made to make inspection effective as near as possible to the source of production and that produce when it reaches Freetown or Bonthe is usually of a satisfactory standard.

129. The Produce Advisory Committee met in February to consider the work of the previous year and to put up proposals to Government for improving the work of inspection. The Committee recommended:—

- (a) An increase in the number of Sub-Inspectors.
- (b) A revision of the Export of Rice Rules.
- (c) Investigations into the possibility of improving the preparation of ginger.

130. As a result of (a), provision was made in the Estimates for 1939 for two additional Sub-Inspectors of Produce. In regard to (b) investigations of certain export requirements were made and draft amendments submitted to Government, while investigations with regard to (c) have already been started.

131. The Produce Advisory Committee serves a very useful purpose. It goes most carefully into all aspects of Produce Inspection and the recommendations it puts up to Government have all been worthy of most careful consideration. Administrative, agricultural and commercial views are all represented and conclusions reached by this Committee must of necessity carry weight. Government has paid the best tribute it can to this Committee by adopting all its recommendations to date.

AGRICULTURAL EDUCATION.

132. The S. B. Thomas Agricultural Academy, Mabang, continues to flourish and under its present energetic Principal, Mr. G. C. Taylor, it has had a new lease of life. The apprentices of the Agricultural Department undergo the first two years of their apprenticeship at this Institution and the batch of apprentices which finished their course at Mabang in 1938 showed considerable improvement in training compared with previous apprentices. The Directors of Education and Agriculture are members of the Board of Management of the Academy and work in the fullest co-operation with the Trustees of the S. B. Thomas Estate, who occupy the other seats on the Board of Management. Despite the work put in by all connected with the Trust, there still remains a difficulty in placing the Trustees' scholars on the land when they have finished their course. This position is receiving careful consideration.

133. In my last report I outlined the scheme, financed by the Protectorate Mining Benefits Fund, for the establishment of a College at Njala wherein the apprentices of the Agricultural Department could undergo their last two years of training and teachers for rural schools could undergo their normal training. This scheme advanced a step further in 1938. A site was selected and buildings were commenced with a view to beginning work early in 1939. Not only were the buildings commenced but the necessary staff was engaged. Mr. H. Earnshaw, who has had previous experience in Nigeria and Kenya, arrived in October to take charge of the Teachers' Course, while Mr. M. J. Douglass, who has had previous experience in Uganda, arrived during the same month to take charge of the final two years course of the Agricultural Apprentices. With these two officers working in co-operation the quality of Agricultural Instructors and Rural Teachers should be markedly improved.

RESEARCH.

134. *Plant Pathology.*—The work of the Plant Pathologist is reported in Appendices V and VI. Mr. Deighton was on leave during part of the year but good use was made of the remainder. Paragraph 5, G (2) and (3) shows the work of the section in relation to the general work of the Department.

135. *Entomology*.—We are still awaiting the appointment of an Entomologist. In the absence of an Entomologist, the Entomological Assistant carried on the lines of investigation started by Mr. Hargreaves and his report (Appendix IV) shows how useful a trained African Assistant can become. Mr. Wellington has well justified his recent promotion.

MASANKI OIL-PALM PLANTATION.

136. During the year an arrangement was made between the Government and the United Africa Company to work Masanki on a partnership basis. As a result, Mr. J. D. Mead was sent to Masanki as Manager and by July a mill was erected to deal with palm produce. In the meantime, work had commenced on the plantation and by the end of the year the palms were once more being properly cared for. The cleaning and opening up of the plantation showed the ravages of the years of neglect in certain areas, but fortunately the plantation had not been left too long and it shows signs of making an excellent recovery during the next two or three years. The Deli oil-palms appear to be doing particularly well.

137. It is too early to report on the economic aspect of this venture. This side of the question will naturally depend upon the price of palm produce, the yield obtained and the costs of production: the first few months of working give no reliable figures.

SECTION III—FINANCE.

138. The accounts of the Department were throughout the year in the charge of Mr. G. A. P. Hamilton, Third Grade Clerk, who has supplied the following notes.

139. The amount approved in the 1938 Estimates for the carrying out of the work of the Department was £22,312 of which £16,127 was for Personal Emoluments and £6,185 was for Other Charges. This shows an increase of £4,467 on the Estimates for the previous year due to a general expansion of the work of the Department.

140. In the course of the year the following supplementary provision became necessary and Special Warrants were accordingly issued by Government:—

	£	s.	d.
(a) For purchase of a safe for the Agricultural Officer, Colony, as a result of the transfer of the Headquarters Branch from Freetown to Njala	17	5	0
(b) For purchase of a motor lorry as a result of the transfer of Headquarters Branch from Freetown to Njala	250	0	0
(c) Course of Instruction—to cover cost of attendance of the Plant Pathologist at the Imperial Institute of Mycology ..	25	7	0

(d) Expenses in connection with Conference of Directors of Agriculture	£	s.	d.
	2	17	0
(e) " Travelling "—to meet cost of daily transport of clerks from Mano to Njala as a result of the transfer of Headquarters Branch from Freetown to Njala	150	0	0
	£445	9	0

141. As a result of the exercise of strict economy by all officers, the fact that Messrs. M. J. Douglass and J. D. Gillespie were not appointed till October and November respectively, and the Entomologist not appointed at all, it was possible to effect a saving of £2,523 4s. 3d. The actual expenditure was £19,788 15s. 9d. made up as follows:—

PERSONAL EMOLUMENTS.

	£	s.	d.	£	s.	d.
Salaries	13,613	6	10			
Duty Allowance	112	17	8			
Seniority Pay	210	7	9			
Acting Allowance	24	19	5			
Allowance in lieu of Quarters	19	15	0	13,981	6	8
OTHER CHARGES.						
Labour	2,703	15	2			
Tools, Appliances, etc.	258	17	6			
Seeds, Export Samples	268	5	8			
Uniforms	120	2	10			
Stock	462	2	6			
West African Agricultural Conference	272	5	6			
Travelling	1,411	3	10			
Contingencies	39	7	0			
Safes	17	5	1			
Purchase of Lorry	226	0	0			
Courses of Instruction	25	7	0			
Expenses in connection with Conference of Directors of Agriculture	2	17	0	5,807	9	1
				£19,788	15	9

142. The cost of each division of the department was as follows:—

Division.	Salaries.	Duty Allowance.	Acting Allowance.	Seniority Pay.	Allowance in lieu of Quarters.	Other Charges.	Total.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Headquarters	2,166 5 8	112 17 8	24 19 5	—	19 15 0	666 5 0	2,988 2 9
Southern Province (including Njala and Sembahun Agricultural Stations)	4,600 6 0	—	—	103 14 10	—	2,510 3 11	7,214 4 9
Northern Province (including Rokupr and Makani Agricultural Stations)	2,490 18 0	—	—	72 0 0	—	1,160 13 1	3,723 11 1
Colony (including Newton and Cline Town Agricultural Stations)	1,217 8 6	—	—	—	—	830 11 8	2,050 0 2
Produce Inspection	1,869 5 1	—	—	—	—	565 1 9	2,434 6 10
Research	1,269 3 7	—	—	34 12 11	—	74 13 8	1,378 10 2
Total	13,613 6 10	112 17 8	24 19 5	210 7 9	19 15 0	5,807 9 1	19,788 15 9

143. *Rice Mill Suspense Account*.—This account shows a profit of £267 6s. 8d. or £212 8s. 0d. more than the profit earned the previous year. A report of the working of the mill is given on page 40 and a summary of the accounts is given below:—

<i>Receipts.</i>						
	£	s.	d.	£	s.	d.
Sales, Rice	410	2	9			
Sales, Bags	53	13	11			
Milling Receipts	916	7	10			
Miscellaneous	47	18	9			
Credits outstanding 31st December, 1938	0	12	11			
Stock in hand 31st December, 1938	114	16	2			
				1,543	12	4
<i>Payments.</i>						
Debits outstanding 1st January, 1938	9	8	4			
Stock in hand 1st January, 1938	111	5	0			
Rice Purchases	306	14	0			
Bags Purchases	54	2	3			
Wages, Millhands and Labour	328	4	4			
Overtime to Millhands and Labour	26	2	3			
Oil, grease, etc.	6	11	6			
Tools, appliances, etc.	23	13	8			
Transport	10	0	6			
Electric light and power	241	10	4			
Repairs and Replacements	98	5	10			
Profit in 1937 not transferred	54	18	8			
Debits outstanding 31st December, 1938	5	9	0			
				1,276	5	8
Profit				£267	6	8

144. Profits earned since the commencement of operation of the Mill are as follows:—

	£	s.	d.
1936	46	19	1
1937	54	18	8
1938	267	6	8

145. *Beeswax*.—The Beeswax Suspense Account showed a loss of £21 6s. 5d. in 1938. This was due to a slump in price in the English market. The price dropped from 106s. a cwt. in 1937 to 82s. a cwt. in 1938. The following is a summary of the account:—

<i>Expenditure.</i>						
	£	s.	d.	£	s.	d.
Stock in hand 1st January, 1938	167	6	10			
Purchases etc., 1938	157	16	5	325	3	3
Receipts, 1938	176	8	7			
Stock in hand 31st December, 1938	127	8	3	303	16	10
Loss				21	6	5

146. *Revenue*.—There was a falling off in the revenue of the Department for the year under review when compared with that earned the previous year as will be seen from the table given below. This was due to two main reasons:—

- (1) There was no necessity for operating the following accounts which were opened in 1937 as a result of a shortage of rice in that year and which yielded profits of over £255 from importing and selling rice:—

- (a) Rice Suspense Account—Agricultural Department.

- (b) Prisons Unallocated Stores Suspense Account (General Stores Suspense Account).

- (2) A fall in amount of Produce Licences by over £160.

	1938.	1937.	Increase.	Decrease.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
<i>Direct Revenue.</i>				
Produce Licences	1,420 18 0	1,583 3 0	—	162 5 0
Fines for Contravention of Native Produce Ordinance	162 3 2	210 15 0	—	48 11 10
Departmental Fines	2 12 3	0 17 4	1 14 11	—
Receipts, Newton Fruit Farm	—	16 10 7	—	16 10 7
Sales, Produce	216 14 11	214 11 10	2 3 1	—
Sales, Old Stores	1 6 9	7 17 7	—	6 10 10
<i>Profits and Losses (—)</i>				
Rice Mill Suspense Account	267 6 8	54 18 8	212 8 0	—
Beeswax Suspense Account	-21 6 5	17 0 6	—	38 6 11
Rice Suspense Account, Agricultural Department	—	4 13 7	—	4 13 7
General Stores Suspense Account	—	251 0 4	—	251 0 4
	£2,049 15 4	2,361 8 5	216 6 0	527 19 1
Total Decrease	...	£ s. d.		
Total Increase	...	527 19 1		
	...	216 6 0		
Net Decrease	...	<u>£311 13 1</u>		

147. *Njala Training Scheme*.—A scheme financed by the Protectorate Mining Benefits Fund for the Training of Agricultural Instructors for this Department as well as Protectorate teachers for the Education Department commenced during the year. Building for the new scheme was started and a statement of the expenditure incurred is given below:—

Recurrent.

	£	s.	d.	£	s.	d.
Personal Emoluments—Agricultural	109	14	8			
“ “ Educational	154	1	7			
				263	16	3

Capital.

Erection of Students Quarters ...	393	5	6			
House for Master of Practising School	13	7	11			
Renovation and Equipment of Practising School ...	40	6	4			
Temporary House for European Officer	99	11	0			
Erection of Teaching Accommodation	59	6	4	605	17	1
				869	13	4

SECTION—IV LEGISLATION.

148. There was no fresh agricultural legislation enacted during the year under review, but the Co-operative Societies Ordinance had a first reading in November and was referred for the Report of a Committee nominated by His Excellency the Governor.

CONCLUSION.

149. The year 1938 was the most successful year yet experienced by this Department. Surveys were carried out, recommendations were made, schemes of work were drawn up as a result of these recommendations, and, in some cases, fresh work had already commenced before the end of the year. The normal work of the Department continued to progress and expand, especially with regard to wet-land rice. This success was only possible by working in the closest co-operation with Administrative Officers in the districts concerned, and by adhering to a definite policy and an equally definite programme of work to implement that policy. All officers knew exactly their part in the scheme of work and carried out their duties uncomplainingly and efficiently under conditions, which, in the swamp rice areas, were often very onerous, unpleasant and unhealthy. I wish to record my great appreciation of the support of all officers of the Department and the gratifying results obtained during a year in which I was absent from the Colony for over six months and the department in the charge of Mr. J. W. D. Fisher.

I have the honour to be,
Sir,
Your obedient servant,
F. J. MARTIN,
Director.

APPENDIX I.

ROKUPR EXPERIMENTAL RICE STATION

BY

A. F. MacKENZIE,
Agricultural Officer.

The experimental work was continued along the lines laid down in previous years. The weather conditions were somewhat abnormal; there was an appreciable dry spell during June, and November was much wetter than usual, tornadoes occurring until late in the month.

NURSERIES.

The fertility of the rice nurseries was reasonably maintained by growing leguminous crops; cowpeas were the main crop, although some *Centrosema*, *Pueraria* and sunnhemp were sown. Some plots received plant ash and decomposed organic matter prior to cultivation.

Ploughing was carried out in the older established areas. The newer area, the West Valley, which is on more sloping ground, was dug over, roughly levelled, the ditches filled in, and all the plots bounded by low bunds. These measures were taken to prevent soil wash, and excessive drainage in the light soil.

The growth in the nurseries was evidently affected by the dry spell in June. The germination of all rices, except Midon—a Burma rice—was satisfactory; but the subsequent growth of many varieties was severely checked by the very heavy incidence of disease, particularly *Piricularia oryzae* and *Helminthosporium* spp. The disease was most severe where soil conditions were poorest. The continued occurrence of heavy infections of *Piricularia* in the nurseries, especially on introduced varieties, such as G.E.B. 24, suggests that, in addition to work on resistant strains, trials should be made with wet nurseries, as there are indications that a low soil-moisture content predisposes rices to infection. It is proposed to make preliminary trials in 1939, to ascertain if wet nursery practice is feasible.

FARM.

During the dry season the drainage system was radically altered, the purpose being to maintain a higher water table in the blocks. On the drier part of the farm the cross-ditches were filled in. Throughout the farm, sills were placed in the ditches, to hold the water up to ground level. At the outfalls of the main ditches sills were also put in at the same level. These measures were on the whole successful; but a slight alteration in the design is necessary to prevent scour at the sides, which in time destroys the effectiveness of the sill. This year ploughing was restricted to three blocks in the driest part of the farm.

Chlorosis was not so pronounced as in the previous year; this may be due to the higher water table preserved by the new drainage system, during low tide. Kavunginpoothala, however, still suffered more than any other variety.

The very severe infection of *Piricularia* in the nursery did not noticeably affect the subsequent growth of the plants in the farm, although it is realized that there is probably some depression in the yield. *Piricularia* was not severe on the grain, although there was an appreciable increase in the number of "blind" heads produced by Kavunginpoothala and Co. 7. *Helminthosporium* was evident on most varieties, but did little damage.

Crabs were not very plentiful during the year and the decrease in numbers was quite noticeable; it is possible that previous cultivations have discouraged them. Adequate guard rows were maintained round all experimental plots.

INTRODUCTION OF NEW VARIETIES.

Five new rices, all short duration varieties, were received from Coimbatore, India; namely:—M.T.U. 3, M.T.U.4, P.T.B.9, Halliya 1,188 and Maskathi. Only very small samples of seed were available, and unfortunately had to be sown rather late in the season. Halliya is promising, Maskathi failed to germinate in the nursery, the others were fair. They will be tested more fully in 1939. One further variety, from Italy, was sown in the nursery, but was killed out by disease.

The three varieties received from Madras late in 1937, reported to be resistant to *Piricularia*, were tested again. No. 11,348 seemed fairly resistant, but No. 10,998 and Co. 4 were not so good. In the farm the first two were heavily infected with *Helminthosporium*. Co. 4 is interesting as it is a very long duration rice.

The four Burma rices, Ngasein, Sughandi, Emata and Midon, which were received in 1936, were subjected to a comparative yield trial with G.E.B. 24 and Toma. The results were:—

Layout.—Latin square of six varieties replicated six times.

Plot size.—12 ft. × 12 ft.

Planting.—Two plants per stand at 6 ins. × 6 ins.

Variety.	Yield in lb./acre.	As per cent. of Toma.
Ngasein	1,729	125·7
Sughandi	1,375	100·0
Toma	1,375	100·0
G.E.B. 24	1,226	89·6
Emata	1,126	81·9
Midon	953	69·3

Statistical Note.—A difference of 308 lb. may be regarded as significant.

Compared with Toma, the most widely grown variety, Ngasein has given a significantly higher yield, and Midon a significantly lower yield. Ngasein and Sughandi are probably suitable for local conditions, but Midon, with a low yielding capacity and its poor germination in the nursery, is not suitable. Emata is not very satisfactory.

PURE-LINE SELECTIONS.

Selection continues on the lines laid down in previous reports.

First Year.—Single plant selections were made from Mokuk, a salt-resistant variety introduced from Hong Kong in 1936. The main consideration was the elimination of awned grain. Red pericarp types were not eliminated, as this may be linked with salt-resistance. A new selection was made from Toma; in this selection the red pericarp types were not eliminated as it is thought that they may give some high yielding strains. The bulk seed from which the selections were made was very mixed both in type and variety; it has been usual to make a preliminary selection to eliminate all varietal types other than that to be investigated. A further selection was made from G.E.B. 24 in an endeavour to isolate a strain resistant to *Piricularia*. A selection was made in the nursery of a large number of plants, which seemed healthy, in plots of G.E.B. 24 which were heavily infected. These plants were grown as a mass selection on the farm, and single plant selection made after flowering. A large number proved to be not true to type; many were probably hybrids, others were rogues.

Second Year.—The 1937 single plant selections of G.E.B. 24 and Co. 7 were subjected to the second stage. In addition to the usual criteria of purity, these selections were also tested for apparent resistance to disease (*Piricularia*) in the nursery. Thirty-six single plant selections of G.E.B. 24 were sown in the nursery; of these six were satisfactory and were planted out on the farm for the usual tests. Unfortunately two of these proved not true to type, being probably hybrids, and the others do not seem very satisfactory. Thirty-four selections of Co. 7 were sown in the nursery, and twelve were passed on to the farm; some were not true to type, but others are promising. Records are still to be completed.

Third Year.—Selected strains of Lal, a local variety, were submitted to a comparative yield trial against the control of bulked farmers' seed from which the original selections were made. The results were:—

Six selected strains and the control.

Layout.—Latin square of seven variants replicated seven times.

Plot size.—12 ft. $\times$ 12 ft.

Planting.—Two plants per stand at 6 ins. $\times$ 6 ins.

Selection.	Yield in lb./acre.	As per cent. of Control.
No. 10	2,088	118·8
9	1,999	111·5
Control	1,788	100·0
No. 22	1,758	98·2
4	1,703	95·2
16	1,529	85·4
18	1,392	77·8

Statistical Note.—A difference of 288 lb. may be regarded as significant.

Compared with the control, selection No. 10 has given a significantly higher yield, and No. 18 a significantly lower yield. The others do not differ significantly from the control.

Fourth Year.—The following strains were grown for observation and multiplication: Bis 101, 107, 112; Bolo 80, 90, 108, 115, and India 25, 28, 37. All these seem satisfactory, and so far are apparently fixed as to type.

Fifth Year.—The following selections were grown for further observation and multiplication: D.C. pa lil 196; Toma 54, 55; Fodea 142, 143, 151; D.C. 5, 39, 42. These have proved satisfactory on the farm. They are a definite improvement as regards quality, and have given good yields. Some of these will be given trials in the district in 1939.

CULTIVATION TRIAL.

This year a long range cultivation trial was initiated. It is intended to cover a period of at least six years. This experiment is designed to examine the effect of deep and shallow cultivations, at various times and periods, on the fertility of the swamp soil. The following are the treatments in the experiment:—

A.—No cultivation.

B.—Cultivation 4" deep in February every year.

C.—Cultivation 8" deep in February every year.

D.—Cultivation 4" deep in July every year.

E.—Cultivation 8" deep in July every year.

F.—Cultivation 8" deep in February every second year.

G.—Cultivation 8" deep in July every second year.

H.—Cultivation 8" deep in February every third year.

I.—Cultivation 8" deep in July every third year.

The results for the first year are as follows:—

Treatment.	Yield in lb./acre.	As per cent. increase over no cultivation.
A.	1,823	—
B. CULTIVATED IN FEBRUARY ...	2,412	32·4
C. " " ...	2,557	40·3
F. " " ...	2,614	43·4
H. " " ...	2,478	36·0
D. CULTIVATED IN JULY ...	2,131	17·1
E. " " ...	2,119	16·3
G. " " ...	2,194	20·3
I. " " ...	2,255	24·1

Statistical Note.—A difference of 210 lbs. may be regarded as significant.

Note.—This being the first year of the experiment all 8" cultivations were carried out. Thus treatments F and H did not differ from treatment C, or treatments G and I from treatment E, during this year. This is borne out by the results.

All cultivations have given significantly higher yields than no cultivation. February cultivations have given significantly higher yields than the July cultivations. There is no difference between 4 ins. and 8 ins. in February or July. The results indicate that early cultivation is better than late cultivation, but so far there is little difference between a shallow and a deep cultivation.

GENERAL MULTIPLICATION AND MAINTENANCE.

The bulk of the rice grown for multiplication was Kavunginpoothala, with G.E.B. 24 and Co. 7 next in importance; these were primarily for maintaining the supply of pure seed in the district. A number of local short duration varieties were collected during the year and grown in maintenance plots. In all, forty-eight varieties and seventy-eight strains were grown on the farm. The following list shows the more important varieties and amount of seed available.

Variety.	Type.	Origin.	lb. Seed.
Bali ...	Salt resistant	Madras, 1931	93
Mokuk ...	" "	Hong Kong, 1936	19
Kavunginpoothala ...	Deep water	Madras, 1931	4,830
Baitel Fakir ...	" "	"	134
Panianala ...	" "	"	94
Indo-China ...	" "	French Guinea	494
No. 79 ...	Short duration	B. Guiana, 1934	200
Lead ...	" "	"	194
D.C. ...	" "	"	240
Blue Stick ...	" "	"	194
G.E.B. 24 ...	Medium	Madras, 1931	3,701
Co. 7 ...	" "	"	2,450
Midon ...	" "	Burma, 1936	140
Emata ...	" "	"	140
Sughandi ...	" "	"	151
Ngasein ...	" "	"	147
<i>Selections of local varieties.</i>			
D.C. 5 ...	Short duration		89
" 39 ...	" "		91
" 42 ...	" "		88
Toma 54 ...	Medium		73
" 55 ...	" "		80
Fodea 142 ...	Long		69
" 143 ...	" "		98
" 151 ...	" "		84
India 25 ...	" "		74
" 28 ...	" "		83
" 37 ...	" "		105
D.C. pa lil 196 ...	" "		46
Miscellaneous ...			14,201
Discards ...			1,846
			1,935
Total ...			17,982

ROYEL DEEP-WATER SWAMP FARM.

This small experimental farm was maintained during the year. Towards the end of the dry season it was cleared of weeds, ploughed, and prepared for planting. Two methods were used. In May, before flooding occurred, one one-tenth acre plot of each of four varieties were sown broadcast at the seed rate of 80 lb. per acre. The four varieties were Kavunginpoothala, Indo-China, Lal and Toma. In June, when flooding commenced, a second plot of each of the four varieties was transplanted in the usual manner, with seedlings from a dry nursery.

The flooding reached its maximum height in September, when the water stood at nearly two feet over most of the farm. The four varieties all did quite well, the broadcasted plots were not so weedy as the transplanted plots, but there was little difference in their growth. The rice ripened off very well in spite of nearly a foot of water on the plots. The yields were quite good and there was very little difference between broadcasted and transplanted. Indo-China gave the highest yield, 2,500 lb. per acre, the others giving about 1,500 lb. per acre.

It is evident that this type of swamp is capable of producing quite good crops, if it is properly cultivated, sown early, and the weed growth kept in check whilst the rice is growing.

APPENDIX II.

NJALA AGRICULTURAL STATION

BY

THE SENIOR AGRICULTURAL OFFICER, SOUTHERN PROVINCE.

STAFF.

Apart from minor changes in staff due to leave, Mr. J. W. D. Fisher was in charge of the station during the first half of the year and Mr. E. I. Nisbett during the second half. Mr. J. D. Gillespie, Agricultural Officer, was transferred from British Guiana and took up duty in the Province on November 30th, while Mr. M. J. Douglass, Agricultural Officer, appointed for special duty at the Njala Training College, arrived on October 22nd. Mr. S. A. Roach, Livestock Officer, was stationed at Njala throughout the year.

MAINTENANCE OF FERTILITY EXPERIMENTS.

Experiments with Pigeon Peas.—This experiment, the design of which was described in the report on this station for 1937, makes use of pigeon peas as the agent for maintaining fertility; but it has been found that pigeon peas do not grow satisfactorily on these plots for more than two years, about which time they die back and are generally killed off by termites. It is now considered that some other leguminous crop must be found for this purpose.

Experiments with Centrosema.—The seed obtained from the Gold Coast turned out to be *Centrosema plumieri* and though sheep at first seemed to eat the plant fairly readily, when they were put to graze on it regularly they lost condition and finally had to be taken off the crop altogether. It is proposed now to conduct trials using *Centrosema pubescens* (as was originally intended), *Pueraria sp.*, and possibly *Calopogonium muconoides*.

Green manure varieties trial.—Seven green cover crops, *Calopogonium muconoides*, *Pueraria sp.*, *Centrosema plumieri*, *Tephrosia candida*, Bengal bean, Sword bean and Pigeon pea were tested against each other. During 1937 the cover crops had been grown and during 1938 rice was grown on all plots. The layout was a 7×7 Latin square. No significant difference was found between the yields of rice grown after the seven legumes tested. The details were as follows:—

Treatments.				Mean yield of rice in lb. per plot.
A.	<i>Calapogonium Muconoides</i>	...	...	74·71
B.	<i>Pueraria sp.</i>	...	...	73·64
C.	Bengal bean	...	...	73·43
D.	<i>Centrosema plumieri</i>	...	...	75·87
E.	Sword bean	...	...	75·14
F.	Pigeon pea	...	...	78·42
G.	<i>Tephrosia candida</i>	...	...	83·4
Mean	...	...	...	76·37
S. E.	...	...	...	5·65

A difference in yield of 16·95 lb. would be significant.

RICE SELECTION.

Pure Line Selection of Upland Rices.—The three varieties Boguti, Jete and D.C. (Upland) underwent further selection. By general observation and yield test the selections have been reduced to seven each of the Boguti and Jete varieties. The plots were subjected to heavy flooding during the abnormal floods of September and the short-growing Upland D.C. selections were entirely lost.

MANURIAL EXPERIMENTS.

A trial was designed to estimate the effect on the yield of Two-Cent Cassava by manuring with rice meal and burnt rice husk alone or in combination at two rates per acre. The layout was a 7×7 Latin square. The plot had a complete cover of pigeon peas during the 1937 to 1938 season. These were dug in May, 1938 as a green manure. The peas were fairly even in

growth but the plot was known to be irregular from a previous rice crop that was grown in 1936. The treatments were as follows:—

A—No manure

B—30 cwt./acre rice meal

C—30 „ „ burnt rice husk

D—30 „ „ each rice meal and burnt rice husk

E—60 „ „ rice meal

F—60 „ „ burnt rice husk

G—60 „ „ each rice meal and burnt rice husk.

Treatment.					Yield per acre; tons.	Yield as Per- centage of mean.
A.=Control	...	...	...	...	4.06	73.95
C.=30 cwt. per acre burnt husk	...	...	...	...	4.51	82.15
F.=60 cwt. per acre burnt husk	...	...	...	...	4.67	85.06
B.=30 cwt. per acre rice meal	...	...	...	...	5.04	91.8
D.=30 cwt. per acre each rice meal + burnt husk	...	...	...	...	5.76	104.91
E.=60 cwt. per acre rice meal	...	...	...	...	6.79	123.68
G.=60 cwt. per acre each rice meal + burnt husk	...	...	...	...	7.26	132.24
Mean	...	...	...	...	5.49	100
S.E.	...	...	...	...	.25	4.55
S.E. $\times$ 3=Significance	...	...	...	...	.75	13.65

No significant differences were obtained from the application of burnt husk but the rice meal gave significant increases at both rates of dressing. The addition of burnt husk to rice meal resulted in only a small increase which was not statistically significant.

OIL-PALMS.

The usual routine operations were carried out in the six plots of native and introduced oil-palms. The records are kept by the Plant Pathologist whose report appears as Appendix VI.

Seed from the self-pollinated Angola palms and from high-yielding Deli palms was sown in the nursery.

COFFEE.

Most of the plots suffered severely from the effects of "harmattan" in the early part of the year. The Robusta under *Gliricidia maculata* suffered particularly. Steps are being taken to improve the shade on this plot and side protection is a matter which is also receiving attention. Generally speaking the various kinds are thriving satisfactorily and fair yields were obtained

CITRUS.

Work on citrus was on lines similar to those of the past few years. Good crops were yielded by the different kinds and scab was again less prevalent on grapefruit from the old Njala plots. The plot of Marsh grapefruit planted in 1936 yielded a small crop.

A well-stocked nursery of budded citrus is maintained for the distribution of planting material.

A start was made on investigations in canning citrus, using the small plant taken over from a local Cold Storage Company.

PINEAPPLES.

Attention was paid to raising planting material for field trials with four varieties:—Smooth Cayenne, Red Spanish, Queen and Baronne de Rothschild.

BLACK PEPPER.

An attempt was made to grow the vines on bamboo trellis support under oil-palm shade. It is doubtful, however, if this will prove successful, and it will be tried on live trees under forest or, at any rate, high bush conditions.

CINNAMON.

The plot of cinnamon, except for one or two blanks, is now well established and the young trees have put on considerable growth.

KOLA.

The plants are thriving though growth is rather irregular.

CHILLIES.

Further trials were carried out with six varieties most of which appear to be promising. They will undergo yield trials next year.

J. W. D. FISHER,

*Senior Agricultural Officer,
Southern Province.*

APPENDIX III.

PRODUCE INSPECTION.

STAFF.

The Inspector of Plants and Produce was absent from the Colony from June 30th until December 17th.

In May, an additional Sub-Inspector of Plants and Produce was appointed.

The distribution of Sub-Inspectors of Plants and Produce, and Instructors engaged permanently on piassava propaganda, was as follows:—

Freetown	...	1	Sub-Inspector of Produce.
Bonthe	...	1	Sub-Inspector of Produce and 2 Instructors touring neighbouring piassava producing areas.
Sulima	...	1	Sub-Inspector of Produce and 1 Instructor touring neighbouring piassava producing areas.
Pendembu	...	1	Sub-Inspector of Produce.
Blama	...	1	" " "
Bo	...	1	" " "
Moyamba	...	1	" " "
Port Loko	...	1	" " "
Makeni	...	1	" " "
Sumbuya	...	1	" " "
Pujehun	...	1	" " "

In addition to the above, three extra Instructors were employed during the ginger season for propaganda among farmers.

PALM KERNELS.

Throughout the year, prices paid to native producers were consistently low. Commencing in January at £5 15s. 0d. a ton (Freetown), prices fluctuated monthly, the lowest point reached was in August when the price fell to £4 5s. 0d. at the beginning of the month. It gradually rose to £4 15s. 0d. at the end of August and remained at this figure with periodic slight variations until the end of the year.

Naturally, the effect of these conditions has been reflected in the tonnage handled by railments and in exports, which compared with similar returns for the previous year reveals a decrease in both instances.

Railments for 1937 amounted to	...	38,694 tons
„ for 1938	„ „ „	32,024 „
Decrease	...	6,670 „

Exports for 1937 amounted to	76,776 tons valued at	£884,812
„ 1938	63,697 „	£457,030
Decrease	„	13,079 „
		£427,782

The distribution of exports between the principal ports in comparison with those for 1937 was as follows:—

		1938.	1937.
From Freetown	...	44,235 tons	53,283 tons
„ Bonthe	...	19,010 „	22,542 „
„ Sulima	...	452 „	951 „

Despite the disheartening conditions which native producers were experiencing throughout the year, it is satisfactory to report that there was very little falling off in the quality of the produce they offered for sale.

Strict inspection of kernels intended for export, combined with advice to producers, has resulted in the kernels conforming to the prescribed standard of purity.

PALM OIL.

Trading conditions in this product were identical with those of the kernel industry, and prices paid for oil intended for export were low throughout the year.

Railments amounted to 1,673 tons against 1,785 tons in the previous year and exports dropped to 1,066 tons against 2,325 tons for the same period.

Distribution of exports was as follows:—

Freetown	...	...	331 tons
Sulima	...	...	—
Bonthe	...	...	735 „
Total	...	...	<u>1,066</u> „

The general quality of the oil was good and compared favourably with that of previous years.

GINGER.

The returns for this product show up satisfactorily compared with others for the year. Railments amounted to 2,947 tons, an increase of 594 tons compared with last year's returns. Exports amounted to 2,705 tons, against 2,384 tons of the previous year.

Propaganda among native farmers was continued during the ginger season with satisfactory results.

The object of propaganda is to instruct farmers in the preparation of their ginger in order that it may comply with requirements of the Native Produce Ordinance. Propaganda has now been carried on during the ginger season for the past five years and its efforts have been directed particularly to the thorough drying of ginger before offering it for sale; thus safeguarding buyers against losses due to shrinkage and mould during storage.

The prices paid during the season to farmers were fairly good, starting at $2\frac{1}{2}d.$ lb. rising to $3d.$ and closing in April—at the end of the season—at $1\frac{3}{8}d.$ lb.

PIASSAVA.

Exports for the year amounted to 3,791 tons; this represents an increase of 399 tons when compared with exports for 1937 and constitutes a record. The exports from the different districts were as follows:—

	1938.	1937.
Bonthe	550 tons	376 tons
Sulima	2,485 „	2,330 „
Freetown	756 „	686 „
Total	<u>3,791 tons</u>	<u>3,392 tons.</u>

Unfortunately, the value of exports was not commensurate with the increase in tonnage, and producers experienced similar disheartening effects of falling prices as in the other forms of produce previously mentioned.

That the demand for piassava from Sierra Leone has increased is beyond question and the export figures give undeniable proof of this.

It is satisfactory to report that as the result of continued propaganda among producers supplying the Sulima market an improvement in the quality of piassava is generally manifest. Propaganda among producers is a task bristling with difficulties among which prices paid for material, and local trade practices, are the greatest. The system of semi-barter, “part cash and part goods,” still prevails in this area and rarely is the ordinary small producer paid in cash. Further, material is not always paid for in accordance with its quality, and well retted material is often given no greater price than that of poorer preparation.

Propaganda is also maintained among producers in the Sherbro area and two Instructors are continually touring the district, advising and correcting errors with regard to preparation.

BEESWAX.

During the year 31 cwt. were cleaned to the required standard and exported by the Department. It realised £127. Commercial interest in this product still lags in spite of the fact that the wax has a ready sale on the markets at home and were it not for Government assistance, there would be no export of this product at all.

PROSECUTIONS.

The number of persons reported for infringement of the Native Produce Ordinance amounted to 148. Of this number 137 were convicted; the remaining 11 cases are awaiting to be dealt with in 1939.

The following shows the number of convictions in each district:—

Bo	...	...	...	...	9
Pujehun	...	...	...	...	25
Moyamba	...	...	...	...	13
Bonthe	...	...	...	...	2
Tonkolili	...	...	...	...	1
Bombali	...	...	...	...	12
Port Loko	...	...	...	...	29
Koinadugu	...	...	...	...	1
Karene	...	...	...	...	10
Freetown	...	...	...	...	17
Kailahun	...	...	...	...	12
Kenema	...	...	...	...	6
Total					137

VERIFICATION OF WEIGHTS AND MEASURES.

The verification of weights and measures was carried out by the Inspector of plants and Produce in the Bo, Moyamba and Headquarters Districts and 214 certificates of justness were issued.

The number of persons against whom proceedings were taken for infringement of the Weights and Measures Ordinance amounted to twenty-four, and are summarized as follows:—

Bo	...	...	...	...	2
Pujehun	...	...	...	...	1
Moyamba	...	...	...	...	13
Port Loko	...	...	...	...	1
Karene	...	...	...	...	4
Freetown	...	...	...	...	3
Total					24

GENERAL.

In spite of the anxious time experienced during the year among those connected with trade, due to the low prices which have prevailed in all products throughout the year, it is satisfactory to record, that the staff have worked smoothly and amicably with all sections of the commercial community. There is, however, room for greater co-operation between traders in some up-country stations and Produce Inspectors, in improving the preparation of certain forms of produce.

F. W. B.-ALLINSON,
Inspector of Plants and Produce.

APPENDIX IV.

ENTOMOLOGICAL WORK.

In the absence of an Entomologist throughout the year, the work of this section continued to be in charge of the Entomological Assistant.

Cacao.—In February, ripe pods at Segbwema remaining from the 1937 main crop were found to be infested with caterpillars of the noctuid moth *Characoma stictigrapta*, Hmps.

Citrus. *Fruit Piercing Lepidoptera*.—Control measures with regard to these pests were continued regularly on the farm at Njala and results have been encouraging; damage to the last Njala main crop of citrus was negligible. Out of 6,746 grapefruit windfalls recorded only 136 were pierced by moths.

The total number of moths caught at night was 776, only 142 (or 18 per cent.) being caught on citrus: the rest were caught on mango, cashew, monkey apple (*Anisophyllea laurina*) and jak fruit. The dominant species was *Othreis fullonica*, L., individuals of which totalled 128. The total number of species represented was thirty-seven, as against thirty for 1937.

The following which appear to be new food plant records were made: (a) adult moths, *Achæa albicilia*, *A. lienardi*, *Anua producta*, *Cyligramma* sp., *Entomogramma pardus* and *Parallelia algira* on *Anisophyllea laurina*; and (b) larva, *Achæa lienardi* on *Diospyros Heudelotii* and *Millettia Barteri*.

Other insect pests of minor importance on citrus at Njala were the butterfly (*Papilio menestheus*, Drury), caterpillars of which damaged new growth and flowers early in the year; the green grasshopper, *Zonocerus variegatus*, L.; and the mussel scale, *Lepidosaphes* sp. The last was effectively kept in check by the red fungus *Pseudomicrocera henningsii*.

Coffee.—Control measures with regard to the lycænid berry borer (monthly hand-picking and burning of damaged berries during the fruiting season) have been continued on the coffee plots at Njala with satisfactory results. Early and late in the year several trees were treated with lead arsenate-lime paint against attacks by termites.

Guava.—Caterpillars of a noctuid moth completely defoliated some trees at Njala, while the "false codling moth" (*Argyroploce leucotreta*) was a serious pest of the fruit. The larva of the latter develops inside the fruit, thereby causing deformity of the fruit and, in many cases, failure to reach maturity; in some cases over 75 per cent. of the crop is lost.

Oil-Palm.—In June, larvae of the beetle *Rhina afzelii* were reported from Fahunya Chieftdom, Moyamba District, as boring into the trunks of palm trees there. The trouble was however not serious.

Locusts (Locusta migratoria L.).—Nineteen reports of swarms were received, as against sixty-six for 1937. As a result of the heavy showers of rain in February and March, all swarms had left the country by April 1st. Only one report of hoppers was received.

Bees.—Experiments with bee-hives constructed from petrol cases are in progress at Njala, and results so far seem to be promising. A swarm which entered on July 11th produced 10 lb. honey and 9 oz. wax by November 11th.

Stomoxys.—Between August and October, there were outbreaks of this blood-sucking fly among cattle in parts of the Protectorate.

With only one exception, a *Stomoxys brunnipes*, all specimens of the flies involved in the outbreaks of the last two years have been identified by the Imperial Institute of Entomology as *Stomoxys nigra*.

J. S. WELLINGTON,
Entomological Assistant.

APPENDIX V.

MYCOLOGICAL WORK.

The Plant Pathologist was on leave from April 13th till October 8th.

Citrus.—Inspections for citrus scab (*Sphaceloma fawcettii*) were continued, and the few trees seen infected with the disease were destroyed or, if only very lightly infected, pruned.

A second record of Pink Disease (*Corticium salmonicolor*) on grapefruit was received from Port Loko in September. *Hypomyces haematococcus* (Berk. and Br.) Wr. has been recorded on grapefruit, in association with Pink Disease at Jaiama.

Many grapefruit trees four years old growing on poor stony soil on a hillside in Freetown were seen to be dying early in 1938. The bark of the stock just below the bud union was killed, and in many cases the trunk was completely ringed. *Peroneutypella pusilla* was growing on the dead bark, and it is possible that this fungus may have been weakly parasitic on these otherwise debilitated grapefruit trees.

BEANS.—Rust (*Uromyces appendiculatus* (Pers.) Lev.) was recorded, in uredo condition only, on climbing French beans (*Phaseolus vulgaris*) at Yengema this year. This is the first record in Sierra Leone. It is of interest to note that *Uromyces vignæ* Barcl. was collected on the wild *Vigna venulosa* in the neighbourhood.

Elsinæ canavaliæ Rac. was also recorded at Yengema on Sword bean (*Canavalia ensiformis*). This is another new record for the country.

PINEAPPLE.—The asterinaceous fungus mentioned in the 1936 Report as having caused some trouble on pineapple leaves at Newton and Njala has now been identified as *Asterinella stuhlmanni* (P. Henn.) Theiss.

MISCELLANEOUS DISEASES.—These include *Exosporium palmivorum* Sacc., on leaves of *Borassus æthiopum*; *Uredo melinidis* Kern (probably), on Efwatakala grass (*Melinis minutiflora*); *Colletotrichum anonicola* Speg. (probably) associated with a rot of sour sop fruit.

The following *Cercospora* spp. have been identified on garden and minor farm plants: *C. bidentis* Tharpe (previously reported as *C. canescens*), on *Cosmos sulphureus*; *C. brassicola* P. Henn., on Chinese cabbage; *C. demetrianæ* Wint. (previously reported as *C. canescens*) on *Crotalaria juncea*; *C. fukushiana* (Mats.) Yamam (previously reported as *C. canescens*), on garden Balsam; *C. hibisci* Tracy and Earle, on *Hibiscus sabdariffa*; *C. ipomoeæ* Wint., on *Calonyction aculaetum* (Moon Flower); *C. nicotianæ* Ell. and Ev. (previously reported as *C. canescens*), on tomato; *C. physalidicola* Speg. (previously reported as *C. canescens*), on Petunia; *C. stizolobii* Syd., on *Stizolobium niveum*; *C. subsessilis* Syd., on *Melia azederach*.

The fungus previously reported as a species of *Piricularia*, on *Solanum* spp., has now been identified as *Eriomycopsis tenuis* Syd.: it is a parasite of a common *Schiffnerula* on *Solanum*.

During the year, 42 identifications of fungi not previously recorded from Sierra Leone were received from the Imperial Mycological Institute. Mr. H. Sydow, who kindly identified some of them, also described (Ann. Myc. XXXVI, 1938) 19 new species of fungi from Sierra Leone. M. Beeli has also published descriptions (Bul. Jard. Bot., Bruxelles, XV, 1938) and illustrations of 32 species of basidiomycetes from Sierra Leone, including 18 new species. Two edible toadstools have been identified: *Mycena termitum* Beeli, a small white fungus growing in large groups on termite mounds; and a cartilaginous fungus common about Njala in June, *Schulzeria striata* Beeli. Dr. C. Chupp kindly examined Sierra Leone collections of *Cercospora* spp. and identified 24 previously not recorded here.

About 170 specimens of fungi and 100 of flowering plants were collected during the year and despatched to the Imperial Mycological Institute and the Royal Botanic Gardens, Kew, respectively, duplicates being placed in the HERBARIUM.

F. C. DEIGHTON,
Plant Pathologist.

APPENDIX VI.

NJALA OIL-PALM PLOTS, 1938.

Cultural operations were the same as in previous years.

The NIGERIAN PALMS are in their eighteenth year after planting. They are now mostly too tall for harvesting to be carried out by means of a short locally made bamboo ladder, and the more expensive method of climbing the trunk has to be relied on.

Eighteen trees of the A, eighteen of the B and one of the C group did not fruit in 1938. Most of these trees have given poor or below average yields in the past, though two of the B trees have given fair yields.

The figures for the YIELD of the different groups, the yield of the whole plantation, and of averages, etc., are given in Appendices A to G. The yield for the year was 4,969 kg. of fruit; 785 kg. less than in 1937. The number of fruit-bearing heads harvested was 656, as against 853 in 1937.

In regard to flowering, the number of female inflorescences at anthesis was 157 more than in 1937. As in 1936 and 1937, the spring wave of flowering was not marked. The number of male inflorescences produced during the year was eighty-six more than in 1937.

The highest yielding A palm gave 55 kg. of fruit as against 64 kg. for the highest yielding B. The average yield of B palms was 1.4 times that of A. In regard to total yield of fruit for the thirteen years 1926-1938, the highest yielding A palm has given 558 kg. and the highest yielding B 526 kg.

The figures for the yield of the NATIVE OIL-PALMS are given in Appendices H-K. The yields were low, as usual, but this year not much lower than the average Nigerian palm. The highest yielding palms in 1938 gave: Kawei 56 kg.; Henoi, 50.5 kg.; Kpolei, 50 kg.

The figures for the yield of the ANGOLA PALMS are given in Appendix L. The total yield was 33 kg. less than in 1937. The low yield of the best tree (17 kg.) was presumably a result of

removal of leaves in the past two years to facilitate self-pollination work on this tree. The six palms gave the following yield of fruit:—

Palms bearing thick-shelled fruit, 63·5 and 40 kg.

Palms bearing thin-shelled fruit, 60·5, 42, 35·5 and 17 kg.

The figures for the yield of the DELI PALMS are given in Appendix M. The yield was 462 kg. less than in 1937, and 20 of the palms did not bear fruit this year. The highest yielding palm in 1938 gave 52 kg. of fruit. The yields of most palms are disappointing, but a few are promising, including one palm which has averaged just over 30 kg. of fruit in the last six years and 45 kg. in the last three years.

BREEDING WORK.—The fruit from three self-pollinated heads of the best Angola palm (2/2) was sown in the nursery in June and July, and about 100 seedlings have appeared. A further three heads from this palm were self-pollinated in December, 1938. One head from the most promising Deli palm (5/6) was self-pollinated in May, 1938, and the seed sown in November.

F. C. DEIGHTON,

Plant Pathologist.

APPENDIX VI.

APPENDIX A.

NIGERIAN OIL-PALMS, NJALA, 1938.

	YIELD OF A.				YIELD OF B.				YIELD OF C.				YIELD OF D.			
	Number of trees from which heads were harvested.	Number of heads harvested.	Weight of heads, kg.	Weight of fruit, kg.	Number of trees from which heads were harvested.	Number of heads harvested.	Weight of heads, kg.	Weight of fruit, kg.	Number of trees from which heads were harvested.	Number of heads harvested.	Weight of heads, kg.	Weight of fruit, kg.	Number of trees from which heads were harvested.	Number of heads harvested.	Weight of heads, kg.	Weight of fruit, kg.
January ...	4	5	74.3	53.0	8	9	129.8	87.8	—	—	—	—	—	—	—	—
February ...	12	15	149.7	99.7	16	22	443.6	169.0	2	2	18.7	12.9	—	—	—	—
March ...	38	49	395.7	263.4	43	56	615.7	410.9	7	7	82.0	55.2	1	1	11.5	7.4
April ...	36	58	568.9	376.7	49	63	751.4	513.3	3	3	28.5	18.9	—	—	—	—
May ...	24	38	260.1	169.3	20	28	325.1	221.4	1	1	7.0	4.8	1	1	2.5	1.6
June ...	7	14	130.5	87.2	12	14	140.4	93.5	1	1	3.0	1.9	—	—	—	—
July ...	12	18	170.6	112.0	17	20	220.1	146.2	3	3	14.5	9.5	—	—	—	—
August ...	16	19	219.8	149.0	14	16	203.2	135.1	3	4	36.3	23.3	—	—	—	—
September ...	21	24	249.3	165.7	27	32	393.5	262.6	3	3	37.5	24.4	—	—	—	—
October ...	23	23	300.5	202.7	25	29	507.0	344.1	—	—	—	—	—	—	—	—
November ...	12	14	167.5	111.1	19	21	337.4	229.2	2	2	27.7	18.8	—	—	—	—
December ...	14	17	195.1	123.1	20	23	359.3	247.0	1	1	24.5	16.1	—	—	—	—
Total	131	294	2,882.0	1,912.9	141	333	4,226.5	2,860.1	14	27	279.7	185.8	1	2	14.0	9.0

APPENDIX B.
NIGERIAN OIL-PALMS, NJALA, 1938.
YIELD OF WHOLE PLANTATION.

		Number of trees from which heads were harvested.	Number of heads harvested.			Weight of good heads harvested, kg.	Weight of fruit, kg.
January	...	12	14	+	26 blind	40	141
February	...	30	39	+	10 "	49	282
March ...	...	89	113	+	12 "	125	737
April ...	...	88	124	+	5 "	129	909
May ...	...	46	68	+	26 "	94	397
June ...	...	20	29	+	6 "	35	183
July ...	...	32	41	+	5 "	46	268
August	...	33	39	+	10 "	49	307
September	...	51	59	+	10 "	69	453
October	...	48	52	+	8 "	60	547
November	...	33	37	+	6 "	43	359
December	...	35	41	+	7 "	48	386
Total	...	287	656	+	131 blind	= 787	4,969

APPENDIX C.
NIGERIAN OIL-PALMS, NJALA, 1938.
ANALYSIS OF INDIVIDUAL TREE YIELD IN THE PLANTATION.

Yield in kg. of fruit.														Total number of trees in the plot bearing in 1938.
	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60	60-65	
Actual plot figures.	A	14	36	29	17	18	10	3	3	—	—	—	—	131
	B	5	25	28	28	15	14	3	10	5	4	—	2	141
	C	3	3	3	2	—	3	—	—	—	—	—	—	14
	D	—	1	—	—	—	—	—	—	—	—	—	—	1
Total (Whole Plot) ...														
Percentage of total number of bearing trees in the plot.	A	10.7	27.5	22.1	13.0	13.7	7.6	2.3	2.3	—	—	—	—	287
	B	3.5	17.7	20.0	20.0	10.6	9.9	2.1	7.1	3.5	2.8	1.4	1.4	
Whole Plantation	7.1	21.9	20.2	15.8	11.1	9.1	2.0	4.4	1.7	1.3	1.1	—	0.7	

131
141
14
1

287

APPENDIX D.

NIGERIAN OIL-PALMS, NJALA, 1938.

COMPARISON OF TOTAL YIELD OF FRUIT OF INDIVIDUAL TREES IN THE PLANTATION FOR THE THIRTEEN YEARS, 1926-1938.

Yield in kg. of fruit.	0-25	25-50	50-75	75-100	100-125	125-150	150-175	175-200	200-225	225-250	250-275	275-300	300-325	325-350	350-375	375-400	400-425	425-450	450-475	475-500	500-525	525-550	550-575	Total number of trees in the plot bearing.	
A	5	4	4	6	11	11	19	19	17	14	20	8	2	5	1	1	1	—	—	—	—	—	—	1	149
B	2	5	—	3	4	7	11	15	14	18	17	15	8	8	8	6	8	—	2	4	3	1	—	—	159
C	—	—	—	1	1	3	1	3	1	1	2	1	—	1	—	—	—	—	—	—	—	—	—	—	15
D	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Total	7	9	4	10	16	21	31	37	32	33	30	24	10	14	9	7	9	—	2	4	3	1	1	—	326

Eight trees have not yet borne fruit.

Eight trees have not yet borne fruit.

APPENDIX E.
NIGERIAN OIL-PALMS, NJALA, 1938.

— — —				Average weight, heads, kg.	Average weight, fruit per head, kg.	Percentage fruit in head.
January—	A	...	...	14.9	10.6	71
	B	...	...	14.4	9.8	68
	Whole plot	...	...	14.6	10.1	69
February—	A	...	...	10.0	6.6	67
	B	...	...	11.1	7.7	69
	Whole plot	...	...	10.5	7.2	68
March—	A	...	...	8.1	5.4	67
	B	...	...	11.0	7.3	67
	Whole plot	...	...	9.8	6.5	67
April—	A	...	...	8.1	5.4	67
	B	...	...	11.9	8.0	68
	Whole plot	...	...	10.9	7.3	67
May—	A	...	...	6.8	4.5	66
	B	...	...	11.6	7.9	68
	Whole plot	...	...	8.7	5.8	67
June—	A	...	...	9.3	6.2	67
	B	...	...	10.0	6.7	67
	Whole	...	...	9.4	6.3	67
July—	A	...	...	9.5	6.2	66
	B	...	...	11.0	7.3	66
	Whole	...	...	9.9	6.5	66
August—	A	...	...	11.6	7.8	68
	B	...	...	12.7	8.4	66
	Whole plot	...	...	11.8	7.9	67
September—	A	...	...	10.4	6.9	67
	B	...	...	12.3	8.2	67
	Whole plot	...	...	11.5	7.7	67
October—	A	...	...	13.1	8.8	67
	B	...	...	17.5	11.9	68
	Whole plot	...	...	15.5	10.5	68
November—	A	...	...	12.0	7.9	66
	B	...	...	16.1	10.9	68
	Whole plot	...	...	14.4	9.7	67
December—	A	...	...	11.5	7.2	63
	B	...	...	15.6	10.7	69
	Whole plot	...	...	14.1	9.4	67
The year A	...	...	...	9.8	6.5	66
	B	...	...	12.7	8.6	68
	Whole plot	...	...	11.3	7.6	67

APPENDIX F.
NIGERIAN OIL-PALMS, NJALA, 1938.

	AVERAGE YIELD OF FRUIT PER TREE.		AVERAGE YIELD OF FRUIT PER ACRE (at 75 trees).	
	A (Number of trees fruiting, 131) kg.	B (Number of trees fruiting, 141) kg.	A kg.	B kg.
January ...	0.4	0.6	30	47
February ...	0.8	1.2	57	90
March ...	2.0	2.9	151	219
April ...	2.9	3.6	216	273
May ...	1.3	1.6	97	118
June ...	0.7	0.7	50	50
July ...	0.9	1.0	64	78
August ...	1.1	1.0	85	72
September ...	1.3	1.9	95	140
October ...	1.5	2.4	116	183
November ...	0.9	1.4	65	108
December ...	0.9	1.8	70	131
Whole year ...	14.6	20.3	1,095	1,522

Average yield over all of fruit per fruiting tree, 17.3 kg. (Number of trees fruiting, 287.)

Average yield over all of fruit per acre (at 75 trees), 1,299 kg.

APPENDIX G.

NIGERIAN OIL-PALMS, NJALA, 1938.
MALE AND FEMALE INFLORESCENCES AT ANTHESIS IN
DIFFERENT MONTHS.

		Number of male inflorescences at anthesis.	Number of female inflor- escences at anthesis.	Ratio of male to female inflorescences at anthesis.
January ...	...	606	42	14·4
February ...	...	179	22	8·1
March ...	...	323	45	7·2
April ...	...	340	47	7·2
May ...	...	219	77	6·6
June ...	...	137	44	3·1
July ...	...	96	42	2·3
August ...	...	202	59	3·4
September ...	...	318	90	3·5
October ...	...	565	147	3·8
November ...	...	474	152	3·1
December ...	...	310	78	4·0
Total for the year		3,769	845	4·5

APPENDIX H.
KAWEI OIL-PALMS, NJALA, 1938.
(161 trees, in their 13th year after planting.)

	Number of trees from which heads were harvested.	Number of heads harvested.			Weight of good heads, kg.	Weight of fruit, kg.	Number of male inflorescences at anthesis.	Number of female inflorescences at anthesis.	Ratio of male to female inflorescences at anthesis.
January	4	5	+	8 blind	13	28	18	131	1.3
February	15	19	+	11 "	30	92	57	104	3.5
March	44	78	+	12 "	90	396	251	87	1.3
April	57	127	+	11 "	138	685	435	85	1.9
May	89	207	+	4 "	211	1,321	853	72	1.4
June	77	128	+	6 "	124	699	453	26	1.0
July	51	82	+	6 "	88	402	251	97	8.8
August	26	42	+	6 "	48	220	140	48	6.3
September	19	24	+	3 "	31	174	114	310	11.9
October	6	9	+	3 "	12	57	38	406	5.3
November	11	21	+	3 "	24	123	80	249	5.9
December	3	5	+	0 "	5	31	19	248	13.0
Total	145	747	+	77 blind	824	4,228	2,709	2,120	3.9

Average yield of fruit per bearing tree, 18.7 kg.

APPENDIX J.
HENOI OIL-PALMS, NJALA, 1938.
(104 trees, in their 14th year after planting.)

—	Number of trees from which heads were harvested.	Number of heads harvested.			Weight of good heads, kg.	Weight of fruit, kg.	Number of male inflorescences at anthesis.	Number of female inflorescences at anthesis.	Ratio of male to female inflorescences at anthesis.
January	10	11	+	9	blind	20	50	33	
February	11	19	+	4	"	23	76	49	0.6
March	43	100	+	11	"	111	346	215	0.5
April	38	76	+	6	"	82	346	219	1.1
May	66	160	+	11	"	171	685	435	1.5
June	51	114	+	13	"	127	511	323	1.0
July	22	34	+	12	"	46	110	67	0.6
August	14	19	+	9	"	28	86	54	2.8
September	5	11	+	10	"	21	71	47	2.7
October	5	8	+	9	"	17	40	26	4.4
November	9	14	+	2	"	16	59	39	3.3
December	2	3	+	2	"	5	12	7	2.3
Total	94	569	+	98	"	667	2,392	1,514	2.2
							797	367	

Average yield of fruit per bearing tree, 16.1 kg.

APPENDIX K.
KPOLEI OIL-PALMS, NJALA, 1938.

(74 trees, in their 13th year after planting.)

	Number of trees from which heads were harvested.	Number of heads harvested.			Weight of good heads, kg.	Weight of fruit, kg.	Number of male inflorescences at anthesis.	Number of female inflorescences at anthesis.	Ratio of male to female inflorescences at anthesis.
January	3	4	+	2	blind	6	31	21	100
February	4	4	+	1	"	5	38	25	20
March	20	47	+	1	"	48	401	262	14
April	25	62	+	1	"	63	484	317	16
May	18	38	+	0	"	38	285	183	8
June	8	13	+	0	"	13	83	53	10
July	4	7	+	0	"	7	39	25	27
August	1	2	+	1	"	3	27	19	99
September	2	2	+	0	"	2	21	14	120
October	2	2	+	1	"	3	26	17	165
November	1	1	+	2	"	3	6	4	107
December	—	—	—	—	—	—	—	—	73
Total	55	182	+	9	blind	191	1,441	940	759
								188	4.0

Average yield of fruit per bearing tree, 17.1 kg.

APPENDIX L.
ANGOLA OIL-PALMS, NJALA, 1938.
(6 trees, in their 12th year after planting.)

— — —	Number of trees from which heads were harvested.	Number of heads harvested.			Weight of good heads harvested, kg.	Weight of fruit, kg.	Number of male in- florescences at anthesis.	Number of female inflorescences at anthesis.	Ratio of male to female inflorescences at anthesis.
January	2	3	+	0 blind	29	18	11	0	—
February	1	3	+	0	20	13	6	2	3.0
March	1	3	+	0	29	19	5	3	1.7
April	4	8	+	0	85	57	7	1	7.0
May	4	12	+	0	108	66	4	2	2.0
June	3	5	+	0	45	30	5	1	5.0
July	2	2	+	0	23	15	3	0	—
August	2	2	+	0	27	18	2	2	1.0
September	2	2	+	0	18	12	4	6	0.7
October	1	1	+	0	15	10	10	5	2.0
November	—	—	—	—	—	—	7	8	0.9
December	—	—	—	—	—	—	3	10	0.3
Total	6	48 + 0 blind	+	0 blind	399	258	67	40	1.7

Average yield of fruit per bearing tree, 43.0 kg.

TABLE M.

DELI OIL-PALMS, NJALA, 1938.

(106 trees, in their 8th year after planting.)

	Number of trees from which heads were harvested.	Number of heads harvested.		Weight of good heads harvested, kg.	Weight of fruit, kg.	Number of male inflorescences at anthesis.	Number of female inflorescences at anthesis.	Ratio of male to female inflorescences at anthesis.
January	...	8	0 blind	73	48	187	31	6.0
February	...	3	1	16	10	76	31	2.4
March	...	9	2	120	84	96	42	2.3
April	...	10	0	89	59	149	34	4.4
May	...	16	0	136	89	138	23	6.0
June	...	26	1	223	147	67	25	2.7
July	...	35	1	364	236	45	11	4.0
August	...	39	1	407	268	148	20	7.4
September	...	18	2	223	148	186	12	15.5
October	...	29	1	342	228	245	9	27.2
November	...	28	3	357	238	252	2	126.0
December	...	14	0	211	139	208	7	29.7
Total	...	235 + 12 blind	= 247	2,461	1,694	1,797	247	7.3

Average yield of fruit per bearing tree, 19.7 kg.

APPENDIX N.

NATIVE, ANGOLA, AND DELI OIL-PALMS, NJALA, 1938.

		Average weight, head, kg.					Average weight, fruit per head, kg.				
		Kawei.	Henoi.	Kpolei.	Angola.	Deli.	Kawei.	Henoi.	Kpolei.	Angola.	Deli.
January	...	5.6	4.5	7.7	9.7	9.1	3.6	3.0	5.2	6.0	6.0
February	...	4.8	4.0	9.5	6.7	5.3	3.0	2.6	6.2	4.3	3.3
March	...	5.1	3.5	8.5	9.7	13.3	3.2	2.1	5.6	6.3	9.3
April	...	5.4	4.6	7.8	10.6	8.9	3.4	2.9	5.1	7.1	5.9
May	...	6.4	4.3	7.5	9.0	8.5	4.1	2.7	4.8	5.5	5.6
June	...	5.5	4.5	6.4	9.0	8.6	3.5	2.8	4.1	6.0	5.7
July	...	4.9	3.2	5.6	11.5	10.4	3.1	2.0	3.6	7.5	6.7
August	...	5.2	4.5	13.5	13.5	10.4	3.3	2.8	9.5	9.0	6.9
September	...	7.2	6.5	10.5	9.0	12.4	4.7	4.4	7.0	6.0	8.2
October	...	6.4	5.0	13.0	15.0	11.8	4.2	3.2	8.5	10.0	7.9
November	..	5.9	4.2	6.0	—	12.7	3.8	2.8	4.0	—	8.5
December	...	6.2	4.0	—	—	15.1	3.8	2.3	—	—	9.9
Whole year	...	5.7	4.2	7.9	9.7	10.5	3.6	2.7	5.2	6.3	7.2

APPENDIX VII.

LIVESTOCK.

During 1938 the tours of the Livestock Officer were connected with the following:—

- (i) Attacks by *Stomoxys* ("fly-worry") on cattle.
- (ii) Investigating the position of the local cattle industry generally.
- (iii) Selecting possible sites for a stock farm.
- (iv) Inspecting villages where poultry extension experiments were taking place.
- (v) Attending the West African Agricultural Conference.
- (vi) Visit to Vom Veterinary Research Station, Nigeria.

CATTLE.

With the exception of "fly-worry" the health of the cattle has been good. In cattle-raising areas seen in March and April (end of dry season), only the animals near Batkanu were showing any signs of the lack of green grass.

"*Fly-worry*."—In the past, reports of flies pestering, and in some cases killing, cattle were taken as probably referring to *Glossina*. In parts of the Northern Province fly-worry has apparently existed for so many years that some cattle-men accept it as a matter of course and do not report the outbreaks. A few have even given up trying to breed cattle in consequence of the severity of the attacks.

It was only when the natives of the Southern Province were suddenly confronted by what was to them an unknown pest that investigations were made and although again the reports were sent in rather late, this year it was possible to gain some first-hand information.

The fly was identified by the Entomological Assistant as *Stomoxys nigra* and this identification was subsequently confirmed by the Imperial Institute of Entomology. So far little is known of its life-history, except that in Mauritius it breeds chiefly in cow-dung and in Uganda in heaps of decaying grass. It is not known how or where it passes the dry season, but the Imperial Institute of Entomology suggests it may possibly retire to the most moist cover available.

In this country, apparently, a few flies first appear in June or July and their numbers quickly increase until the climax is reached in August or September. Towards the end of September they begin to decrease, and the process is so rapid that by mid-October there are none to be seen.

In the first stage of an outbreak a general attack is made on all the animals in the herd, and this usually results in a stampede for the bush, the maddened cattle being recovered with much difficulty—in some cases not at all. Gradually the flies concentrate on the weaker animals—old cows and calves—and these they stick to so persistently that the animals are soon exhausted by extreme hunger, thirst and lack of rest, as much as from loss of blood, and collapse follows. They are then dispatched by their owners, who make no attempt to nurse the weakened beasts by providing them with food and water. There is little doubt that such animals could be saved given due care.

Post-mortem Examination, showed very anæmic conditions, and innumerable blood-stained punctures were visible on the inner surface of the hide, but blood smears taken in several cases did not show the presence of any disease.

The distress caused by the bites alone must be considerable, for they are very painful to human beings, and the insect is such a voracious feeder, that when it has once inserted its proboscis it ignores all attempts to drive it away. It is literally possible to scrape off the flies as they feed on their host. For this reason they were easily destroyed by sprays and advice was accordingly given to cattle-owners concerned, as well as suggestions as to possible measures for preventing the flies from breeding. The natives have attempted some control measures themselves, one being a dressing of palm-oil and kerosene, and another of "Coondi" oil but these are not commonly used.

It is significant that in the Northern Province where the cattle graze away from the towns they have been subject to attacks by *Stomoxys* for many years, whilst in the Southern Province it was only when the herds were moved from the towns—to comply with health regulations—that they were molested.

It has also been stated that, where there has been a fresh outbreak, the cattle have been either in the vicinity of, or mixing with, bushcow.

There is no doubt that the activities of *Stomoxys* are very discouraging to native cattle-breeders and are the cause of serious loss to the country generally.

Cattle-thefts.—Another drawback to the cattle industry is the cattle thief, and many are the complaints against him. The introduction of effective branding, and a permit system to control the movement of cattle would help to check this nuisance, and the possibilities of these measures are being investigated.

Nondescript Bulls.—Too many young, and in some cases stunted, bulls are allowed in a herd. This has resulted in many inbred and undersized cattle in the country. It is proposed to have a castration campaign as soon as possible, using bloodless castrators. Later, men trained to the use of these instruments could tour the country regularly. The cattle-owners with whom this scheme has been discussed seemed to realise its advantages.

Milk Products.—Several cattle-owning chiefs have asked for advice as to marketing milk. As clean and properly clarified butter should find a ready market in the country, the training of men in the preparation of this commodity should be undertaken when the proposed stock farm is established.

Barren Cows.—The proportion of barren cows in the country seems to be large. Inquiries brought to light the fact that in cases where the after-birth does not come away normally no steps are taken to remove it. The inflamed condition which follows as a consequence of this lack of treatment is probably the cause of much of this sterility.

SHEEP.

Most of the sheep in the country are rams or wethers brought from French Guinea by traders; there are not many ewes to be seen.

In many cases ewes and lambs show signs of *Helminthiasis*.

Most ewes seem to give birth to twins or triplets, and the result is many young sheep die during the first month or two from malnutrition, or do not grow as they should.

Culling of the weaker lambs would greatly improve the flocks, but the native does not yet see that it would be to his advantage in the long run.

GOATS.

These seem to do quite well, especially the brown variety. That they are not seen in large numbers is probably due to the difficulty of herding such animals.

PIGS.

Many of the pigs seen are decidedly underfed, and are kept under most filthy conditions. Very few good specimens have been noticed. The boars are mostly stunted and are put to service too young: nothing approaching the proper standard of a boar seems to be kept. Some fairly good sows are in evidence, but until the importance of the sire is realised there is little hope of bettering the breed.

Males are sometimes castrated, and some fairly good hogs result.

STOCK PURCHASED FOR TRIAL AT NJALA DURING 1938.

Cattle.—Cows 5, yearling heifer 1, bull calf 1.

Sheep.—Ewes 6.

Pigs.—Sow 1.

The cattle bought were fairly good specimens. Ewes are difficult to come by, so there was not much choice. The sow, judged by local standards, is good.

DISEASES IN CATTLE.

According to figures obtained from Medical Officers in the Protectorate, out of 654 cattle slaughtered—

8·7 per cent. had liver fluke;

6·1 per cent. had *Angioma* of the liver;

3·4 per cent. had *Cysticercus*.

There were no cases of tuberculosis.

Sheep, goats and pigs slaughtered appeared to be free from any of the above.

STOCK FARM.

Various localities in the Northern and Southern Provinces, including the Neremafondi plateau, were examined at various times. By the end of the year it seemed probable that a site at Tekaw, on the railway three miles from Makeni, would prove the most suitable.

STOCK AT NJALA.

Cattle.—In December a work-bullock died suddenly apparently from heart failure. As a precautionary measure the whole carcass was burned. Otherwise the cattle kept very well and in good condition. Two cows bought at Kailahun in August gave birth to heifer calves in December. From each a pint and a half of milk was taken every morning, the rest being left for the calves who ran with their mothers during the day. The calves appeared to be getting a plentiful allowance of milk, as they kept in a thriving condition.

The working oxen were frequently employed in carting sand, rubble and earth for various purposes.

Cattle at the end of the year numbered:—

Bull	...	...	...	1
Cows and Heifers	...	...	...	6
Bullocks	...	...	...	2
Bull calves	...	...	...	1
Heifer calves	...	...	...	2
Total				...
				12 head.

Sheep.—The results with sheep are disappointing. Eleven died during the year, mainly from plant poisoning and weakness due to severe infestations of worms. The worms chiefly *Hæmonchus contortus*, seemed to gain ground during the time the sheep were grazing on *Centrosema*.

A raised, slatted floor was built in the sheep's sleeping quarters, to prevent their sleeping on their droppings.

Worm-pellets were administered weekly but had no beneficial effect until the animals were moved from the *Centrosema* plots, which had evidently been a source of reinfection.

Sheep at the end of the year numbered twenty-eight.

Centrosema Experiment.—The sheepfolding trial on *Centrosema plumieri* was commenced on 24th May. The plots were 208 feet by 36 feet. Twenty-three sheep for five consecutive days spent from 9 a.m. to 5 p.m. on the plots to be grazed. At first the animals took fairly kindly to the *Centrosema*, but after the first week they were visibly falling off in condition. A supplementary ration—8 lb. of guinea corn—was then given in the evening; and a slight improvement in condition followed. Later it was found necessary to increase the amount of guinea corn to 11 lb.; this was done from 3rd July. On 9th July the corn ration was increased to 16 lb. but still the condition of the animals remained below what it had been when they were on mixed grazing.

By October they would only take small nibbles at the *Centrosema*, and spent their time trying to break out. On 23rd November the experiment was discontinued. By then the animals would not touch the *Centrosema*, and the ewes were unable to feed the lambs.

After a month of mixed grazing the sheep had picked up wonderfully.

Hay.—During November and December grass and Pueraria hay, sufficient for use in the dry weather, was made and stored. Both cattle and sheep show a preference for the Pueraria hay.

Grass Experiment.—Several grasses collected from Sefadu and Segbwema were planted in August.

Pennisetum purpureum has done very well. Although planted in mid-August it had reached the height of 4–5 ft. by mid-October and was cut for the stock. On 23rd November it was cut back at the height of 3 ft. By 24th December it was 2 ft. high and was cut again. At the end of the year it was still green and growing but naturally not showing such vigorous growth as during the rains.

Building and Fencing.—Besides the erection of poultry houses and pens, the cow-shed was completed, a manure and hay shelter, and a pig-house and yard were built. Fences necessary to protect various plots were erected.

POULTRY.

At Njala.—5,050 eggs were laid, 222 were sold for hatching and a large proportion of the remaining 4,828 were incubated. Unfortunately there were many infertiles in January, February and March.

Including hatches from imported eggs, ducks and guinea fowls, the number hatched was 675.

Hatches from imported eggs, especially from two sources were very poor, the eggs apparently having suffered in transit.

Internal parasites have been as troublesome as ever, chiefly round, tape and gizzard worms. Periodic dosing for the first two were necessary throughout the year. These worms are so bad that they seriously affect the egg-production, and if neglected cause many deaths. Gape worms have been dealt with successfully by the use of Spratt's Blackerite.

Steps are being taken to move the runs to fresh ground as another measure against worms. Hawks, snakes, bush cats and driver ants have also been troublesome. Chicken pox and roup were prevalent, but were dealt with successfully.

Ages at which Hens come into Maturity.—The following facts from observations at Njala are of interest:—

Pure-bred R.I.R. reach maturity at 10 to 12 months

$\frac{7}{8}$ -bred	„	„	„	„	9	„	10	„
$\frac{3}{4}$ -bred	„	„	„	„	8			„
$\frac{1}{2}$ -bred	„	„	„	„	6	„	7	„
Guinea hens	„	„	„	„	14			„

Although they take so long to reach maturity the guinea hens, if prevented from sitting are prolific layers. One hen laid ninety-six eggs in five months, and was still in lay when she was killed by a bush cat.

Of the Rhode Island Reds, the best hen (No. 564) has an average of 12.33 eggs per month over the year while the best half-bred hen (No. 53) laid an average of 10 eggs per month over the year.

Trap-nesting has been started with native hens so that good stock can be selected for cross-breeding.

Culling.—Strict culling, at different ages has been carried out, so the number of birds reared appears small compared with the number hatched, but some good breeding pens have been formed and the hens are running with unrelated cocks.

Hardening Birds for Distribution.—Young birds for distribution have been allowed a free range and their food gradually changed to what they are likely to get under native conditions. This is necessary as a number of young cocks sent out for experimental purposes died soon after being exposed to the unusual conditions.

Sixty-eight fowls were distributed for breeding purposes. Of these thirty-eight were sold and thirty distributed as follows:—

To Sefadu Village Experiments (2)	...	...	6 cocks
„ Kafe Chieftdom (Tonkolili)	...	...	3 „
„ Gbenderu (replacement)	...	...	1 cock
„ Jala, Komboya Chieftdom, Bo	...	...	1 „
„ Agricultural Officer, Colony for distribution	...	...	12 cocks
„ Agricultural Officer, Makene for breeding	...	...	1 cock
„ Agricultural Officer, Makene for breeding	...	...	6 hens.

Guinea Fowls.—A number of these have been bred during the season and it is hoped to distribute sittings of eggs and pairs of breeding birds in the coming year. There is no doubt these birds will lay well if discouraged from sitting and after the age of six weeks are very much hardier than the domestic fowl.

Ducks.—The Muscovy ducks were given access to the river. The unlimited exercise caused a marked improvement in their laying, but unfortunately most of the eggs were infertile—as many as twenty out of twenty-four in one batch.

Although Muscovy ducks are poor layers they are extraordinarily hardy in comparison with fowls and seem not to be affected by worms. As soon as their feathers appear they thrive rapidly.

Aylesbury Ducks.—Forty-eight Aylesbury eggs were imported from Reading University Farm. Both natural and artificial incubation were employed, but the hatches were disappointing; nearly 50 per cent. of the eggs went rotten during incubation. Fourteen ducklings hatched out and eight survived. They grew very rapidly, as these comparative figures show:—

Aylesbury ducklings, $3\frac{1}{4}$ months old weighed 4 lb. $4\frac{1}{2}$ ozs.

Muscovy ducklings, $3\frac{1}{4}$ months old weighed 2 lb. 5 ozs.

Both birds were drakes and both were in thriving condition.

Of the eight Aylesbury ducklings only one is a duck, but as these birds have thrived so well more ducks are being obtained for breeding purposes.

Several of these birds have had attacks of rheumatism but recovered on being kept from the water for a few days. Of those that died, one was badly infested by round worm.

General Conclusions on Poultry.—From results at Njala and from observation of native-owned birds, it seems that it is not profitable to attempt hatching during the rains as the chicks are very subject to colds, roup, chicken-pox, and especially to gape worms. All worms are very active during wet weather and besides the deaths they cause, they so debilitate the birds that, at the best, they grow up weaklings. Hatching should be carried out from December to mid-March.

By breeding from the best Rhode Island Reds and native hens there is little doubt that birds of good size and good laying capacity can be produced in Sierra Leone, but many difficulties are encountered when breeding on a very large scale. The very wet conditions of the country, the many common ailments and natural enemies (hawks, driver ants, bush animals, snakes) the high price of food, the lack of certain ingredients essential to laying fowls, and the low prices obtainable for eggs and table-birds make poultry rearing not a very paying proposition. Farmers should raise fowls as a side-line only.

Muscovy ducks, however, should be encouraged as they are so much hardier than fowls, grow faster, need less food as they forage so well on their own account, and are more suited to the wet conditions.

Imported ducks are being introduced by the Department to try out dual purpose birds and to find out the most suitable for our conditions. Such trials are being carried out at Njala.

Guinea fowls also should be more widely kept. Except that the chickens are very subject to gape worms, these birds are very hardy, are good table-birds, and if prevented from sitting, are good layers.

POULTRY EXTENSION WORK.

Gbenderu, Kenema District.—Up to the last visit in August, the experiment showed fairly satisfactory results. Unfortunately, two of three pure bred cocks supplied last November had died, one from apparently untreated worm trouble, the other being run over by a motor car. Another cock was supplied.

As quite a number of good birds with Rhode Island Red characteristics had been raised, the headman was advised to carry on without further free supplies from the Government. By selling his $\frac{3}{4}$ -bred cocks he could with ease purchase pure bred cocks from Njala and thus continue improving his fowls.

Sefadu—Court Messengers' Barracks.—Up to September this experiment showed very satisfactory results indeed, despite the loss of cocks. The original cocks were replaced by others from Njala. Offers of 3s. to 4s. had been received for young cross-bred cockerels. Next year the sale of young $\frac{3}{4}$ -bred cockerels should bring in ample funds to buy more pure-bred cocks from Government. That this experiment has shown such good results is due to the interest and care shown by the District Commissioner, his Chief Clerk and the Sergeant-Major of the Court Messengers.

Kinsi Village.—This experiment showed fairly satisfactory results up to September. A little carelessness had been displayed, but this was remedied. Fresh cocks were issued in September. In order to carry on improvement of fowls here, cross-bred cockerels should be sold and the money put into pure bred ones.

Kafe Chiefdom, Tonkolili.—Three $\frac{7}{8}$ -bred Rhode Island Red cockerels were delivered to the District Commissioner, Mabonto, in October.

Jala, Komboya Chiefdom, Bo District.—The chief received a pure bred cock and hen in December this year. The cock was given to him, but he bought the hen. He is to run eleven native hens with the pure bred cock and hen. If the hen lives he should produce his own pure bred birds and also $\frac{1}{2}$ -bred pullets and thus carry on. A visit to Jala is contemplated next year. A similar experiment is going on at Daru.

It is noticed that an interest shown by the District Commissioner in these ventures is an important factor towards success.

S. A. ROACH,
Livestock Officer.

APPENDIX VIII.

DISTRIBUTION OF PLANTING MATERIAL, 1938.

Food Plants.		Northern Province.	Southern Province.	Colony.
<i>Anona Cherimolia</i> , seed, packet ...	...	—	3	—
Avocado Pear seedlings ...	...	—	20	110
Banana suckers ...	...	442	—	—
Breadfruit ...	...	—	7	—
Breadnut ...	...	—	7	—
Cabbage, seed, pkt. ...	...	—	1	—
Cacao ...	...	—	200	—
Capsicum, pkt. ...	...	—	3	—
<i>Calopogonium mucunoides</i> , seed, lb. ...	...	—	5	—
Cassava, Mayugbe sticks, bundles ...	...	—	50	—
Cassava, Two-Cent „ „ ...	...	—	50	—
Cashew ...	...	—	14	—
<i>Centrosema</i> sp., seed, lb. ...	...	—	18	—
Chili, Tuticorin, seed, pkt. ...	...	—	1	—
„ Hontaka Type B, pkt. ...	...	—	1	—
„ Jap Type A, pkt. ...	...	—	1	—
„ Portuguese West Africa ...	...	—	1	—
Cinnamon seedlings ...	...	—	3	—
Coffee, Robusta, seed, lb. ...	...	—	60	—
„ „ seedlings ...	...	7,563	1,405	402
„ <i>Stenophylla</i> , seed, lb. ...	...	—	12	—
„ „ seedlings ...	...	—	—	585
Egg-plant, pkt. ...	...	—	1	—
Ginger, lb. ...	...	—	1,298	—
Governor Plum ...	...	—	28	—
Grapefruit, budded plants ...	...	—	369	—
Guava, seedlings ...	...	—	46	—
Jakfruit, seeds ...	...	—	409	—
„ „ seedlings ...	...	—	2	—
Kola ...	...	—	35	—
Lemon, Eureka ...	...	—	2	—
„ Genoa ...	...	—	26	—
„ Lisbon ...	...	—	11	—
Mandarin Villa Franca ...	...	—	12	—
Mangoes, budded ...	...	—	—	37
Muskmelon, Eden Gem, pkt. ...	...	—	1	—
Onico ...	...	—	4	—
Oil-palm, seedlings ...	...	1,231	—	—
„ Deli, seedlings ...	...	—	1,391	150
Okra, White Velvet seed, pkt. ...	...	—	1	—
Orange, Lue Gim Gong ...	...	—	183	—
„ Late Valencia ...	...	—	35	—
„ St. Michael ...	...	—	43	—
„ Washington Navel ...	...	—	46	—
Paw-paw, seed, pkt. ...	...	—	8	—
Pepper, black, cuttings ...	...	—	2	—
Pigeon Pea, lb. ...	...	—	160	—
Pineapple, suckers ...	...	304	—	—

APPENDIX VIII—*continued.*DISTRIBUTION OF PLANTING MATERIAL, 1938—*contd.*

Food Plants.		Northern Province.	Southern Province.	Colony.
Pitanga Cherry, cuttings ...	...	—	71	—
Rice, G.E.B. 24, seed, bushels ...	...	1,535	152	134
" C.O. 7, " " " " ...	...	124 $\frac{3}{4}$	—	—
" Kavunginpoothala, bushels ...	...	69 $\frac{1}{2}$	—	1
" No. 79, seed, " " " " ...	...	21 $\frac{1}{2}$	—	—
" Lead " " " " ...	...	18 $\frac{3}{4}$	—	—
" Toma " " " " ...	...	—	—	18
" Toma 55 " " " " ...	...	16	—	—
" Blue Stick " " " " ...	...	14 $\frac{1}{2}$	—	—
" D.C. (B.G.) " " " " ...	...	15	—	—
" D.C. " " " " ...	...	—	—	1
" D.C. Upland " " " " ...	...	—	—	57
" D.C. Pa lil " " " " ...	...	4	—	—
" Panianala " " " " ...	...	9	—	—
" Baitel Fakir " " " " ...	...	9	—	—
" Bali " " " " ...	...	8	—	—
" C.O. 5 " " " " ...	...	6 $\frac{1}{2}$	—	—
" Fodea " " " " ...	...	2	—	1
" Mokuk " " " " ...	...	1	—	—
Rose Apple ...	...	—	14	—
Sapodilla ...	...	—	6	—
Spinach, seed, pkt. ...	...	—	1	—
Sisal, bulbils ...	...	—	185	—
Sour sop ...	...	—	12	—
Sweet sop ...	...	—	46	—
Sweet lime ...	...	—	16	—
Tangerine, budded ...	...	—	55	—
Tangerine, seedlings ...	...	—	17	—
Tomato, seed, pkt. ...	...	—	9	—
Yam, Jafna King, lb. ...	...	—	181	—
" Port Loko white, lb. ...	...	—	81	—
" Yellow, lb. ...	...	—	62	—
" Mayoso, lb. ...	...	—	4	—
" (All Varieties), lb. ...	...	3,422	—	—

APPENDIX VIIIA.

DISTRIBUTION OF PLANTING MATERIAL, 1938.

ORNAMENTAL PLANTS FROM NJALA AGRICULTURAL
STATION

<i>Acalypha</i> ...	...	...	...	...	162
<i>Adenanthera pavonina</i> ...	...	...	...	...	40
<i>Agave americana</i> ...	...	...	...	...	14
<i>Allamanda</i> , cuttings	...	...	...	...	16
<i>Allamanda schottii</i> ...	...	...	...	...	3
<i>Angelica</i> —bundles of cuttings	...	...	...	...	143
<i>Aristolochia gibbosa</i> , pkt. ...	...	...	...	...	1
<i>Aristolochia splendens</i> seed, pkt.	...	...	...	...	8
<i>Bambusa arundinacea</i> , cuttings	...	...	...	...	10
„ <i>acuminata</i> , seed, pkt.	...	...	...	...	12
<i>Bauhinia monandra</i> , seed, pkt.	...	...	...	...	12
„ <i>tomentosa</i> ...	...	...	...	...	13
<i>Bignonia unguis-cati</i> ...	...	...	...	...	15
<i>Bougainvillea</i> , purple, cuttings	...	...	...	...	47
„ red, cuttings	...	...	...	...	94
„ crimson, cuttings	...	...	...	...	54
<i>Brunfelsia americana</i> , seed, pkt.	...	...	...	...	8
<i>Caladium bicolor</i> ...	...	...	...	...	10
<i>Cana</i> , tubers, Red	...	...	...	...	14
„ „ Yellow	...	...	...	...	14
„ „ Orange	...	...	...	...	14
<i>Cassia siamea</i> , seed, pkt. ...	...	...	...	...	22
„ <i>auriculata</i> ...	...	...	...	...	2
„ <i>sieberiana</i> , seed, pkt.	...	...	...	...	7
<i>Cactus</i> ...	...	...	...	...	1
<i>Clerodendron fallax</i> ...	...	...	...	...	16
<i>Clerodendron paniculatum</i> ...	...	...	...	...	51
<i>Cockscomb</i> , pkt. ...	...	...	...	...	1
<i>Coreopsis</i> , pkt. ...	...	...	...	...	1
<i>Croton</i> ...	...	...	...	...	82
<i>Dillenia indica</i> , seed, pkt. ...	...	...	...	...	2
<i>Dracaena</i> (cordyline), cuttings	...	...	...	...	11
<i>Duranta</i> sp. ...	...	...	...	...	96
<i>Erythrina glauca</i> ...	...	...	...	...	22
<i>Euphorbia</i> sp. (cactus-like)	...	...	...	...	2
„ <i>Deightonii</i> ...	...	...	...	...	2
<i>Frangipani</i> ...	...	...	...	...	30
<i>Flamboyante</i> ...	...	...	...	...	1
<i>Gardenia</i> sp. seed, pkt. ...	...	...	...	...	2
<i>Gliricidia maculata</i> , cuttings	...	...	...	...	36
<i>Gmelina hystrix</i> ...	...	...	...	...	22
„ <i>arborea</i> ...	...	...	...	...	8
<i>Galphimia brasiliensis</i> ...	...	...	...	...	1
<i>Hibiscus</i> , cuttings	...	...	...	...	92
<i>Holmskioldea</i> sp. ...	...	...	...	...	1
<i>Hydrangea</i> ...	...	...	...	...	38

APPENDIX VIII A.—*continued*.DISTRIBUTION OF PLANTING MATERIAL, 1938—*contd.*

ORNAMENTAL PLANTS FROM NJALA AGRICULTURAL STATION.

<i>Ipomoea dissecta</i> , seed, pkt.	...	...	...	...	1
<i>Ixora coccinea</i> ...	...	...	...	...	54
<i>Ixora Lutea</i> ...	...	...	...	...	124
Jacquemontia, seed, pkt.	...	...	...	...	2
Jacquemontia, seedlings	...	...	...	...	44
<i>Jasminum grandiflorum</i> ...	...	...	...	...	12
<i>Jasminum pubescens</i> ...	...	...	...	...	7
<i>Jatropha curcas</i> , pkt.	...	...	...	...	1
„ <i>multifida</i> , pkt.	...	...	...	...	16
„ <i>podagrica</i> ...	...	...	...	...	8
<i>Kleinovia hospita</i> , seed, pkt.	...	...	...	...	1
Kopsia ...	...	...	...	...	10
<i>Lagerstrœmia flos-regina</i> , pkt.	...	...	...	...	7
<i>Lagerstrœmia indica</i> ...	...	...	...	...	70
<i>Leucœna glauca</i> ...	...	...	...	...	36
<i>Mimosa rubricaulis</i> ...	...	...	...	...	12
Moon flower, seed, pkt.	...	...	...	...	5
Morning Glory ...	...	...	...	...	26
<i>Ochna kirkii</i> ...	...	...	...	...	1
Oleander, cuttings	...	...	...	...	134
<i>Petrea volubilis</i> ...	...	...	...	...	2
<i>Peltophorum ferrugineum</i> ...	...	...	...	...	12
<i>Pithecolobium unguis-cati</i> ...	...	...	...	...	27
Plumbago ...	...	...	...	...	7
Poinsettia, cuttings	...	...	...	...	127
Pride of Barbados, seed, pkt.	...	...	...	...	11
Pride of Barbados, seedlings	...	...	...	...	6
<i>Pueraria phaseoloides</i> , lb. ...	...	...	...	...	31
Purple plant ...	...	...	...	...	1
Quisqualis ...	...	...	...	...	60
Saman, seed, pkt.	...	...	...	...	4
Screw pine ...	...	...	...	...	21
<i>Solanum macranthum</i> ...	...	...	...	...	22
<i>Tecoma stans</i> , seed, pkt.	...	...	...	...	11
<i>Thevetia negriifolia</i> , seed, pkt.	...	...	...	...	2
<i>Thunbergia erecta</i> ...	...	...	...	...	30
<i>Thunbergia laurifolia</i> ...	...	...	...	...	40

APPENDIX IX.

PLANTS AND SEEDS INTRODUCTIONS, 1938.

					Origin.
<i>Alibaca rosea</i>	...	...	...	...	U.S.S.R.
<i>Malope trifida</i>	...	...	...	...	"
<i>Oenothera biennis</i>	...	...	...	...	"
<i>Spartium Junceum</i> L.	...	...	...	...	"
Bean, Bush Bonavist (Climber)	...	...	...	...	British Guiana
" Bush Bonavist (Dwarf)	...	...	...	...	"
" Finger-shaped Bonavist	...	...	...	...	"
" Hastings	...	...	...	...	"
" Bora (Short)	...	...	...	...	"
" Black-eyed Pea	...	...	...	...	"
" Black Sinebone	...	...	...	...	"
" Waby	...	...	...	...	"
" White Sinebone	...	...	...	...	"
" Peleugale	...	...	...	...	"
" Pegya	...	...	...	...	"
Pigeon Pea	...	...	...	...	Grenada
<i>Pithecolobium dulce</i>	...	...	...	...	Sudan
<i>Azadirachta indica</i> (Neem)	...	...	...	...	Gold Coast
Green gram	...	...	...	...	"
Vanilla	...	...	...	...	Trinidad
Vegetable seeds	...	...	...	...	United Kingdom
" "	...	...	...	...	France

APPENDIX X. RAINFALL, 1938.

Months.	NORTHERN PROVINCE.						SOUTHERN PROVINCE.						COLONY.						
	Batikanu.	Kabala.	Mabonto.	Makeni.	Marampa.	Rokupr.	Bo.	Bonthe.	Jalama.	Kallahun.	Koyema.	Moyimba	Njala.	Segbwema.	Yenema.	Freetown.	Hill Station.	Kissy.	Newton.
January ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
February ...	—	0·13	0·61	0·25	—	0·03	1·73	—	—	—	—	0·61	0·880	1·17	—	Trace	—	—	—
March ...	0·21	3·59	0·96	1·32	0·66	0·07	4·16	4·10	4·81	4·40	3·50	1·89	6·020	1·30	4·59	0·09	0·51	0·03	0·34
April ...	5·52	4·08	0·99	2·55	2·60	1·77	4·34	3·80	4·83	7·92	7·84	4·30	5·405	5·31	2·72	0·77	0·20	2·62	2·02
May ...	8·79	7·93	14·89	15·73	9·96	11·35	21·66	—	17·85	13·47	21·16	12·276	14·875	14·96	13·86	9·58	9·52	12·44	11·62
June ...	14·74	11·71	16·36	18·56	12·72	9·96	14·62	—	55·85	15·66	14·46	11·74	14·380	11·19	5·35	13·33	14·97	11·30	8·60
July ...	14·06	17·24	12·66	14·07	14·63	16·31	18·02	—	12·66	11·53	20·38	14·71	14·410	9·87	10·64	28·91	43·98	25·86	26·94
August ...	23·83	17·83	30·35	28·87	24·96	26·17	22·96	23·43	25·14	14·83	27·18	18·87	19·845	14·64	15·35	33·11	39·63	33·25	33·54
September...	21·12	15·95	30·16	24·71	20·60	22·20	18·86	—	14·84	17·14	19·90	22·47	19·145	12·21	14·47	24·88	26·53	23·09	18·21
October ...	19·74	14·52	15·08	16·26	16·53	13·57	12·95	—	13·01	15·60	18·04	11·264	13·375	10·16	11·56	12·83	13·37	10·46	5·65
November...	—	3·43	10·36	11·31	4·09	9·30	9·97	—	9·39	7·11	8·81	—	7·065	8·28	6·72	5·10	5·99	5·65	8·371
December ...	—	—	0·04	—	—	—	0·25	—	0·05	—	—	0·23	0·010	0·16	0·01	0·02	0·16	—	0·39
Totals	120·01	96·41	132·44	133·63	116·75	110·73	129·52	X	158·43	97·66	141·27	98·36	115·360	89·25	85·27	128·62	154·86	124·70	115·681



